

THE IRON AGE

New York, April 6, 1916

ESTABLISHED 1855

VOL. 97: No. 14

The Organization of a Modern Foundry

How Responsibility for Good Service Is Placed in the Jobbing Plant of the Metals Production Equipment Company

BY WILLARD F. ROCKWELL[†]

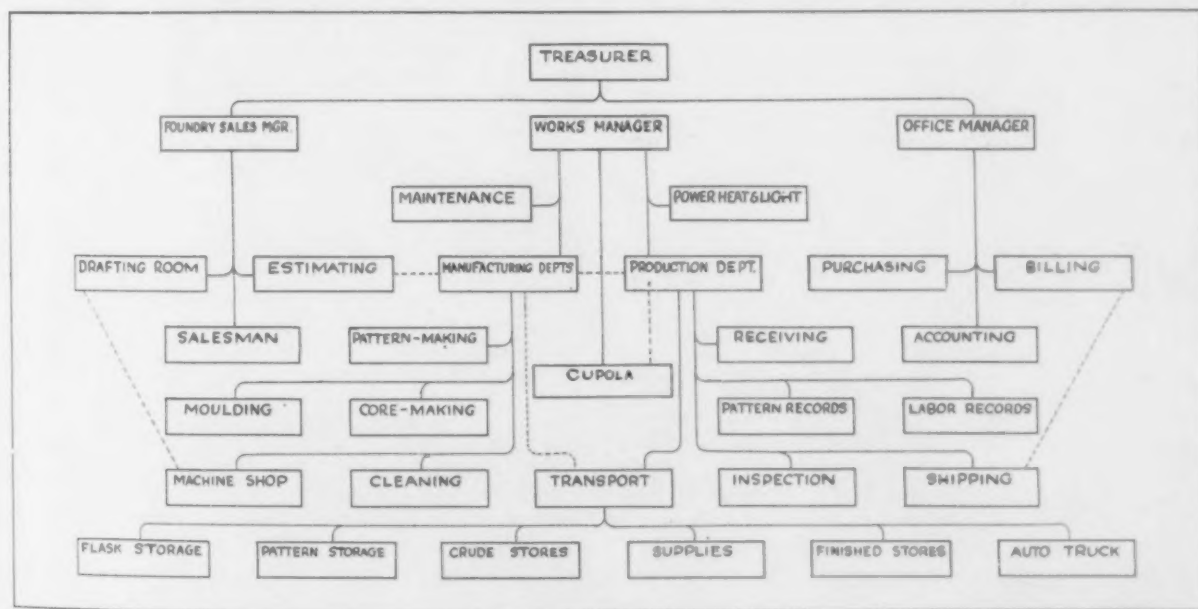
THE modern foundry does not represent much of an advance over its predecessors unless there is a clear-cut organization and a well-planned system, resulting in improved service to the customers. In the foundry of the Quigley Furnace & Foundry Company, now the Metals Production Equipment Company, described in THE IRON AGE, Feb. 12, 1914, constant effort has been made to develop the organization and the internal system in such a manner as to keep it abreast of the times.

In a jobbing foundry the system is likely to become top heavy if it follows the lines used in foundries devoted to manufacturing standard machinery, such as those connected with automobile

Metals Production Equipment Company is evidenced by the accompanying chart of organization.

The treasurer and general manager has under his direct charge a sales manager, a works manager and an office manager. The duties of each of these men are clearly defined, and each of them is held responsible for his department of the work.

The works manager has charge of all manufacturing departments, but those duties which require continuous personal attention are delegated to capable assistants, who are essentially functional foremen. The cupola boss is held responsible for cleaning and maintaining the cupola, weighing and placing the charges, regulating the blast and similar



Organization Chart of the Metals Production Equipment Company's Foundry, Production and Office Departments. The lines of authority are indicated by full lines, while mutual dependence is shown by the dotted lines

manufacturing plants. One customer of this foundry, who manufactures automatic machinery, builds more than forty different types, and another builds machine tools of a wide variety of types and sizes calling for over 2000 patterns.

The jobbing foundry organization should be such that the responsibility for giving good service is clearly defined from the time the customer's order is received until the cleaned castings are shipped and billed. That this plan has been followed at the

routine. The works manager, however, takes personal charge of formulating the mixture for each day's operation, and endeavors to produce a melt to run sound clean castings with the particular qualities desired by the trade. This duty of determining the proper mixture of iron is considered one of the most important duties of the works manager. No other single factor is so important in producing good castings. The works manager has an assistant who is responsible for maintaining the building, equipment and power plant in such a manner as to give the manufacturing department

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the very best service. This assistant also has charge of welfare and safety work.

There is a foreman in charge of each manufacturing department who is responsible for the quality of work and the economy of the department. He does not, however, have to spend time in planning work for customers, nor answering inquiries from customers about the progress of work. This is taken care of by the production department, or, as it is sometimes called, the planning department. The production department receives the order from the salesman or customer as soon as it has been passed for credit by the treasurer. Production orders are immediately made out on each department which will be called upon to handle some phase of the work. When an order for castings is received, the production department makes out an individual order for each pattern. Copies of these orders are sent to the coreroom, the pattern storage department and the shipping department. These copies give all available information concerning the number of castings wanted, the date that they are wanted, the standard time (taken from previous records if the pattern has been used before) and the estimated or standard weight of the castings. The pattern stores clerk receives his orders every afternoon and proceeds at once to get out the required patterns and core boxes. The orders are attached to the patterns before being placed on a platform from which they are taken each morning by the transport department.

The transport department works under the direction of the production department and has charge of all movements into and out of the various stores and storage departments. In every department there is a space set aside for materials and equipment which are to be moved from the department, and adjacent to this a space for placing all shipments into the department. These places are called stations. Each morning the foreman of the transfer department goes to the pattern stores station and moves all patterns to the foundry, separating them into classes for bench, floor and machine molding. Flasks and core boxes are also found at their respective stations and are brought to the stations in the departments which require them. When the work called for is completed, these patterns and core boxes are returned to these stations and the transport department returns them to the proper station in the storage departments.

Each morning the foundry foremen go to the receiving stations in their departments, and after examining the various patterns assign the work to the molders. The foremen have the standard time on all patterns taken from previous records, and are thus able to give out the work with a degree of certainty that each molder, or each group of molders and laborers, will have sufficient work, and will also be able to complete the work according to schedule. The foremen are able to give the various molders the particular class of work on which they have had the most successful experience.

Just before the heat is ready, the timekeeper visits each molder and obtains a list of the molds from each pattern. This list serves both the cost and the production departments. In the production department the information obtained is used to indicate on the production order the work done for each customer. Subsequent reports from the cleaning and inspection department show any deduction for defective work. The cleaning department shakes out the molds, prepares the sand for the next day's work and moves the castings to the cleaning department, where they are cleaned, inspected and sorted out for shipment. The shipping department

checks the order for each pattern, makes out the necessary shipping instructions, and is held responsible for securing accurate weights and charges against each customer.

There is a complete system of production records which enables the production department to calculate each day the weight and cost of the melt and the percentages of good and defective castings, remelt and invisible loss. Comparison of the shipment weights against these figures over a given period affords a precise check on the figures. The production order, pattern records and labor records are numbered and filed in such a way that the accumulated information can be referred to at any time, which makes them invaluable when repeat orders are received. If this cumulative record shows a very large proportion of defective castings from any one pattern, this information is immediately conveyed to the foundry foreman, who is expected to investigate and find out whether the fault is in the pattern, lies with the molder, or is inherent in the design of the part.

A copy of this organization chart is kept by each individual who is responsible for maintaining service to customers. It serves to remind them of their responsibilities, and has been effective in making employees anxious to perform their functions in such a manner as to uphold the reputation of the company.

Electric Furnace Castings for Chicago's Jobbing Trade

The Electric Steel Company, Chicago, has its new steel foundry under way and is pouring several heats a day from its one-ton Snyder electric furnace. A selected grade of low phosphorus scrap is charged, and the treatment of the steel in the bath and the ladle is directed toward the production of especially tough and dense castings. It is expected that the furnace, working on a melting time of an hour and a quarter per heat, will yield an average of eight heats a day.

A simple and effective arrangement for the mixing and distribution of sand well suited to the needs of this first unit of the foundry consists of a motor-driven Simpson intensive mixer located immediately in front of the sand storage bins which are housed in a lean-to of the main building. The mixer is placed astride a pit which permits lowering a large box directly under the discharge spout. This box is handled by means of a 7½-ton Whiting crane to any part of the floor. This device, while not a finished method by any means, is an expedient arrangement with a wide field of adaptation.

As a substitute for crucibles, the prices and limited supply of which have rendered their use well-nigh prohibitive, steel buckets of about 3/16-in. plate, lined with refractory clay, are used for pouring, having a life of from four to five heats. While the labor required in cleaning the buckets and relining for each heat must represent a large item of their cost, they appear to meet the requirements as a temporary substitute. A battery of oil-burning heaters is installed for drying out the linings. Oil is also used to heat the core oven and the annealing furnace, the burners being of the type obtainable from the National Supply Company, Chicago.

Chicago has but one successfully operating jobbing steel foundry, and the Electric Steel Company still has before it the opportunity of being the first electric furnace foundry to become permanently established in the jobbing trade in that city.

The C. A. Lawton Company, De Pere, Wis., founder and machinist, specializing in power transmission machinery, has booked an order for 700 large metal pulleys up to 90 in. in diameter, for delivery to a factory supply house in the Central West. The company's shops are working a night shift to fill the order.

Safety in Westinghouse Electric Works

Some of the Later Safeguards Developed at the East Pittsburgh Plant

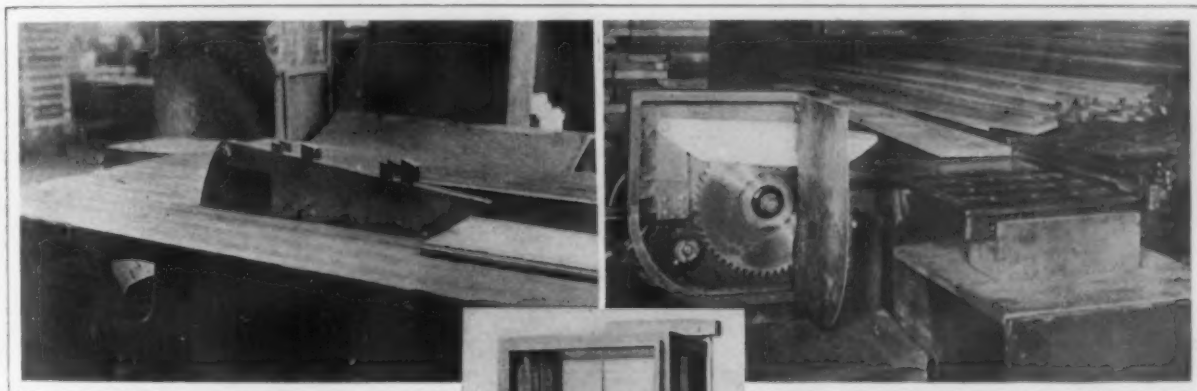
AMONG recently developed safeguards and safety measures at the works of the Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa., two forms of saw guards stand out conspicuously. These and other devices and arrangements looking to the welfare of the employees of the company are shown in the accompanying illustrations. They represent developments made under the direction of C. B. Auel, director of Standards, Processes and Materials.

The guard for the rip saw entirely covers the saw so that no part of it is visible and the supporting bracket for the overlapping leaves is directly in line with and of no greater thickness than the saw. The lightness of the different parts is noteworthy as is also the manner in which the different leaves are quickly dropped, owing to their loosely hinged support, so that small pieces of wood are not hurled away from the saw and are yet easily removable. The cross-cut saw has a guard which travels with the saw as indicated in the mounting,

so low that workmen could easily put their heads into the elevator well in looking to ascertain the position of the car, the upper part of the gate space is closed with a sheet of asbestos cloth. This sheet is suspended from an iron rod along the top or near the ceiling and the iron rod is free to move a limited distance with the gate as indicated. Flat spacious hooks attached to the gate lift the rod and at the same time keep the asbestos from bagging. In one particular case where this type of protection gate has been installed, the elevator gate is handled manually by the elevator operator.

Two of the reproduced photographs show safety measures applied to ladles. Besides being in the nature of safety devices, the ladles are self-skimming as will be seen, the lead, for example, pouring through the spout from the bottom and leaving the dross on top. The ladles are adapted to right or left-hand workers.

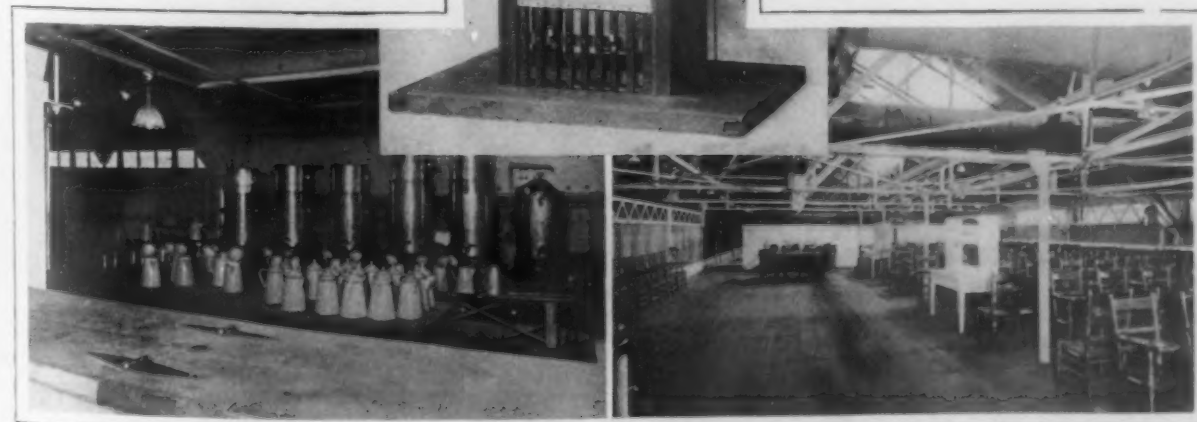
The remaining pictures give some idea of the facilities provided for the luncheon hour for the



and when the sawing operation is completed, the saw is returned to a protective housing which has a door giving access to the saw, also as shown.

Another one of the views shows a partly collapsible gate for an elevator well. Where the headroom is not sufficiently great to allow a high gate to be moved far upward; in other words where the gate would be

women workers. A coffee kitchen is installed and the distribution is through the small coffee pot, to the local service tables. Chairs with a wide arm for holding dishes, such as are common in self service restaurants, are provided for individual use. The lunching space is provided in a balcony of one of the larger shops, which are conspicuous for their great length.



Two Safeguards for Saws; an Elevator Gate with a Flexible Top Extension; the Arrangements for Luncheon for the Women Employees

Conserving the Worker's Health and Energy*

Proper Shop Hygiene, the Study of Fatigue and the Institution of Rest Periods for Maintaining Health and Increasing Output

— BY F. B. AND L. M. GILBRETH† —

To all interested in the human element the problem of conservation is, perhaps, more interesting than any other. This has to do, in the case of the industrial plant, with the holding of the men once they have been obtained and trained, and with preserving or increasing their mental and physical health, and prolonging their years of productivity.

The boys of the organization are of two kinds: 1. Those who are not apprentices, but who enter the organization without any particular agreement as to the amount of time they are to remain and the amount of actual training they are to receive. 2. The apprentices who are, preferably, of several kinds.

The advantages of having several types of apprentices is that in this way boys and young men may be received into the organization, say, at the close of the grammar school period, at the close of the high school period, and at the close of the college period, and may be trained in a more systematic way to their own advantage and to the advantage of the organization. These apprentices are held not only by reason of their agreement, and their pay, which is sufficient and which increases at such a rate that they are willing and glad to put in that time required for their training, but also by reason of the diplomas that they receive at the end of their time.

The second group of workers in the organization who demand attention are the grown men who have been employed, but either not successfully placed, or placed in a position that, while it seemed at first satisfactory, has proved on longer occupancy not thoroughly satisfactory either to them or to those in charge of the placement. Such men are held by being shifted from one line to another until that line or place that is best suited to them is discovered.

The third type comprises the adult skilled workers who have been properly placed, and who must be so employed that they will be held with mutual satisfaction in the position to which they are assigned. This is usually not a difficult matter, as the functional division of duties permits many more opportunities for the man to be assigned to work that he likes, and as proper incentives in the line of pay, promotion, and interest are provided for the purpose of stimulating his ambitions.

The fourth class of workers is really a subdivision of this third class, consisting of the older men whose life of activity in the average organization would have ended.

PROLONGING THE WORKING PERIOD

Scientific management can pride itself upon the fact that it, more than other types of management, has prolonged the years of working activity for those who work under it. This it does in three ways:

1. By actually conserving the health of the worker and thus allowing him to have more working years, even at work that demands strenuous physical exertion.

2. By so functionalizing the work that, if a kind demanding strenuous exertion becomes too exacting the worker may be transferred to another subdivision of the same or similar work, and may thus continue active.

3. By its constant demand for teachers who are trained and experienced workers. The worker who finds that all continuous physical exertion is tiring may be transformed into some type of teacher, and may thereby prolong his years of usefulness almost indefinitely.

Measured functional management appreciates, as has no other type of management in the industries, the value of conserving and using the experience of the older men.

TAKING CARE OF SURPLUS WORKERS

The second phase of the problem of conservation concerns what is to be done with the surplus workers; in fact, with all members of the organization, during dull times, when the work is scarce. The real solution of this problem lies in prevention rather than cure. It is an important function of the management to maintain as even regularity of employment as is possible. All departments of the organization are supposed to co-operate to see that work is distributed as evenly as possible throughout the year. It is the duty of the selling department to estimate the probable demand for the product as far in advance as is possible. It is the duty of the production department to sort the work, and to see that any work not immediately required is postponed until what would ordinarily be the dull season, etc.

Much work that has always been considered to be seasonal has been rearranged or supplemented in some such way that the workers can be employed throughout the entire year. A new line of seasonal work that is busiest at the dull season of the regular work may be taken on. Other special ways of keeping the men at work are: To utilize slack time to make up ahead certain parts which will be needed during the next period of activity; to keep in touch with employment bureaus of organizations whose work may be of such a nature that they can use men not needed during the dull time; to assign high-priced men to low-priced work rather than lose them when no high-priced work is available. This is often necessary in a scientifically managed plant. The high-priced man may be kept on the higher wages, the excess in wages being considered a retaining fee to hold his services until such time as he can again be assigned to his special high-priced work. In every case the high-priced man appreciates the situation, and in return co-operates in every possible way to make himself profitable to the organization.

CONSERVATION OF HEALTH

The third phase of the problem of conservation is the maintaining of the health of every member of the organization, called the problem of hygiene. It divides into mental hygiene and physical hygiene. The minds of the workers are kept in good condition through the teaching, which is both general and

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†Consulting engineers, Providence, R. I.

specific; through the interest which the work and the way in which it is taught arouses; through the stimulation of the records of others, but more especially of their own records; through the promptness of the rewards, and through the elimination of all possible mental disturbance.

The wastefulness of being obliged to make unnecessary mental decisions for choice of motions is well understood, and while every one is encouraged to fit himself to go as quickly as he can into such departments as require the making of decisions, yet in every case the making and repeating of unnecessary decisions is as far as possible eliminated. The right habits that are formed by the system of education under scientific management have their effect upon mental as well as physical methods, and bring about that regularity which is a fundamental necessity of good health.

THE QUESTION OF MONOTONY

Many questions have been asked regarding the wisdom of the methods that scientific management uses in this field. One concerns "monotony." Few realize that "monotonous" is not necessarily synonymous with "displeasing" or "tiring." Many things that are monotonous are very pleasing; for example, rhythm. It is not generally realized that rhythm is most helpful as well as pleasing in many kinds of physical effort. It is also not generally realized that monotony is often not particularly fatiguing. In fact, actual measurement shows that those who excel at any one kind of work find it less fatiguing to do it continuously than to do several kinds of work at which they are less skilled. The most monotonous work is work that one is obliged to do over and over again, *but at which one is not skilled.*

This leads naturally to the question of specialization. One who has studied the subject does not doubt that the highly specialized investigator in any field of knowledge has a most interesting and profitable life. But the moment one suggests specializing the work of a laborer horror and distrust of the results is expressed. Now, it must be understood that the method of attack of the specialist under scientific management is the same no matter what his specialty. That is, he adopts the most efficient way of arriving at results in some particular field. This method of attack, once learned and applied to one particular field, may be transferred to any other field in which the man who has learned it becomes interested. No specialist who has been trained along the line in which he is interested ever finds his work monotonous, no matter how many times he is called upon to perform it. He can always see problems that would never present themselves to one untrained in his particular line. If the man has been assigned to a type of work which, together with its opportunities for high pay, cannot arouse and hold interest, it is probably because that work is of too low a grade for him, and he should be transferred to a different field.

PHYSICAL HYGIENE

The questions of physical hygiene may be grouped under two heads: 1. Standardizing conditions; 2. Overcoming fatigue.

It is not generally understood that the provision for proper lighting, heating, ventilating, etc., that are undertaken by many of the older types of management more as welfare work than anything else, are an integral part of the establishment of scientific management. It is the duty of the organization to provide everything that will make the worker more valuable to himself and to the organ-

ization. In plants far enough advanced there is also much time given to questions of nourishment and clothing, and to similar subjects, that heretofore have been considered to lie more or less within the field of personal decision of the individual. While it is not desirable to do away in any respect with personal liberty, yet it certainly is a part of the duty of the management to give every one connected with the organization an opportunity to have that food and clothing which will make him best able to do his work.

These problems have been excellently worked out in many parts of this and other countries in connection with the schools. The results there easily can be transferred into the field of the industrial plants, as has already been demonstrated. This is, however, no new idea in this field, as for many years it has been our practice not only to provide for all possible hygienic betterment in the plant, but to try to influence the home lives of the members of the organization.

THE PROBLEM OF FATIGUE

The problem of fatigue is closely related to the problem of standardizing all working conditions, since the first part of the problem of fatigue consists of eliminating unnecessary fatigue. The second part of the problem consists of providing proper rest periods for overcoming necessary fatigue, and of seeing that these rest periods are spent in such a manner as will do the most good. The inspection of the working conditions that could be done by an expert in hygiene and sanitation will do much to cut down fatigue. Much will also be done by the rearrangement of equipment as a result of motion studies, and the standardization of devices that results from motion study.

Perhaps the most interesting to the general reader of such standardized devices, because they come most often into the line of his experience, are the chairs and tables of two heights, with extension legs. No better appreciation can be gained of the lack of improved types of management in many industrial establishments than by starting, practically anywhere, to observe whether chairs of any type are provided for the workers, and how well those that are provided are adapted for the purpose.

A survey of the conditions actually existing in the shops of even the really progressive manufacturers and retailers would surprise them, as well as the inquirer. It is astounding how few devices have been introduced primarily for the express purpose of reducing fatigue. A tremendous waste, consisting entirely of fatigue for which there is no earthly excuse, can be demonstrated in a short space of time.

In order to stimulate interest in such fatigue-reducing devices we have started a small museum for the exhibition of devices for the elimination of unnecessary fatigue. This is interesting chiefly in that, while it has existed now for more than two years, and has been called to the attention of thousands of progressive business men and manufacturers, it, as yet, contains very few exhibits, simply because of a general lack of realization of the present needless fatigue. Yet an examination of such as have been submitted will show that such devices are by no means expensive. This does not mean to say that a great deal of expense would not be justified, because such a device, especially a chair, is a piece of equipment that the worker will need throughout his entire working life. It is not apt to require frequent change, and the small expenditure at the outset would be justified in all cases.

A very little time and money will not only conserve the worker, but will add greatly to his capacity for work, to the material advantage of himself and the entire organization. The lack of devices for eliminating unnecessary fatigue is the result of nothing but ignorance on the part of both the employers and the employees.

Some of the fatigue-eliminating devices will be used during the working periods, some will be used during the rest periods, and some used during both periods. These should be planned for at the same time, as it is now generally recognized that the most important element of a resting period is a change of blood pressure. This may often be provided during the work period by having work tables or benches made of such a height that they may be used while standing, and by devising a special high chair upon which the operator may sit during certain parts of the work period without changing the position of any of his working materials or tools, or his relative height, whether standing or sitting, at his table. If such a chair is put on rollers or castings, it may be pushed out of the way, or pulled back into place with the expenditure of but two motions and without even a glance to see where it is located.

REST PERIODS

The length and distribution of the rest periods is a problem which has as yet been properly standardized in but very few trades. It can never be properly solved without co-operation with physiologists and psychologists. In some kinds of work, the work itself provides natural rest periods; in others there are no such rest periods, and resting time must be arbitrarily established so as to give the greatest output with the least fatigue. But much can be one, even before accurate measurement, which is a real need, is made, by supplying the simplest of working and resting chairs, and by noting the effect upon the condition of the worker and the output.

It must always be remembered that the worker himself is a poor judge as to what is really the least fatiguing chair or stool for him. None of us is a good judge, no matter what we do, unless we have made the subject a special study. No short time test can give reliable information as to which chair will be the best for long service. Anything to which we have become thoroughly accustomed is, of course, usually easier and less tiring than a new way of doing work, especially after the first excitement of the change has subsided. Therefore, the results of the old and new methods must be accurately measured and recorded. A striking example of this lack of realization as to what is truly comfortable is the case of a girl who had been working where there were a large number of high-speed machines that caused great vibration. By means of a simple device the vibration was entirely eliminated. The girl said she was no more comfortable in the special chair without the vibration. Yet after several weeks of work under the new conditions, followed by a time when it became necessary for her to work where there was again vibration, she became sick in less than half a day from the vibration, and was obliged to go home. The same state of affairs had been found to be true with workers who were in chairs too high or too low for them, or chairs with a sharp instead of a curved edge. They invariably felt sure that the make-shift cushions and bolsters or other help-outs which they had devised were much more comfortable and less fatiguing than the new form of chair. Yet after a time actual measurement demonstrated their

actual improvement under the new type of equipment.

There is seldom difficulty in inducing a worker to try a new fatigue-eliminating device or method, if he realizes the purpose. If he is not brought into the proper frame of mind, there is something wrong with the teaching in the plant. When the teaching is right, he will usually be glad to try any new plan suggested. If the idea of conservation is thoroughly established in the plant, and every one understands that, while waste of material things has been deplored, waste of human energy is far more serious, savings will be so great as to surprise even the most sanguine.

Can Company Suit Not Dropped

Baltimore advices state that the Government will ask for a decision by the United States District Court in its suit for the dissolution of the American Can Company. A conference of attorneys for both sides was held April 1 with Judge Rose to determine the method of procedure to get the case before the Supreme Court. It was arranged that the motion asking for a decree dissolving the company will be followed two weeks later by a brief outlining the Government's contentions. The company will then have three weeks within which to answer the petition of the Department of Justice.

It will be recalled that Judge Rose handed down an opinion Feb. 23 in which he permitted the company to continue business, although he held that it had been originally illegally organized. No decree was signed. This action was taken so that the Government would have the right to avail itself of the testimony taken in the case and ask for a decree against the company if it should violate the law in the future. George Carroll Todd, assistant to the Attorney-General, explained after the conference with Judge Rose that the decision is now wanted by the Government for the purpose of appeal, whether the decree is favorable to the company or the Government.

New York City Wants an Examiner of Purchases

Purchasing agents are invited by the city of New York to compete for the position of chief examiner, purchases and supplies, paying \$5,000 per annum. This position is not to be confused with that of director, central purchase committee, also for the city government, announced in these columns two weeks ago. Applications for the last-named position closed March 31, while April 13 is the last day for the receipt of applications for chief examiner.

The present duties of chief examiner are: 1, to supervise (under the direction of the director of the bureau of contract supervision) the force engaged in carrying to completion the preparation of standard specifications governing the purchase of all classes of supplies and materials by the city, and in currently revising specifications already adopted; 2, to assist in developing plans for centralizing the purchase, distribution and control of all supplies for the city of New York. Applicants must have had executive experience of a kind tending to qualify for the position and must be at least 25 years of age. Applications are received at room 1400, Municipal Building.

The Ingersoll-Rand Company reports for the year ended Dec. 31, 1915, a balance, after the payment of preferred dividends, of \$4,535,560, as against a balance of \$973,586 in the year preceding. The earnings for the year were \$5,459,884, as against \$1,967,723 in 1914, and the balance before the payment of preferred dividends was \$4,687,078. A surplus remained after the payment of common dividends of \$3,265,480, as against a surplus of \$550,241 in 1914, and a total surplus was on hand at the close of the year of \$5,333,323, as against a surplus of \$2,067,843 at the close of 1914.

HEAVIER LOADING OF CARS

What Steel Corporation Subsidiaries Accomplished Last Year

BY J. F. TOWNSEND*

The great shortage of cars which has afflicted the shipping public generally throughout the country is especially acute in the greater Pittsburgh district to-day. It is interfering with the operation of blast furnaces, steel works and mills, and with the early approach of the opening of navigation on the Lakes, when the demand for equipment to supply mines with cars for Lake coal will be increased and cars must be found to handle the greatest movement of iron ore the country has ever seen, those in touch with the situation appreciate that car supply will be a very serious problem.

The solution of this problem would be very simple if we could turn back but ten years and apply the methods of to-day to the traffic of ten years ago; but this is impossible. While some great strides have been made in the adoption of modern equipment of much larger capacity and of improved methods for heavier loading of cars, the increased volume of traffic the railroads are confronted with to-day far exceeds the most advanced plans of the railroads to provide adequate facilities for the natural increase in the general business.

Some people look upon the present demands upon the railroads as abnormal and the heavy volume of traffic as of a temporary character. As a matter of fact, the periodical boom in business seen in this country every decade, with more or less regularity, was a little late this time and was naturally stimulated by the European demand. There can be no question that the business has come to stay and will keep on rolling up bigger and bigger until the railroads will be absolutely blockaded with traffic in every direction, unless there is something done by the real shippers who are responsible for the congested condition at the Atlantic seaboard and in New England to-day.

TOO MUCH STOREHOUSE USE OF CARS

Throughout this vast country thousands of concerns are trying to supply something or other for Europe at very high prices. The conditions of sale are f.o.b. cars at point of shipment, so that as soon as a minimum carload is loaded and the bill of lading issued, it is taken to the bank and the shipper gets his money. He cares very little about what becomes of the shipment or when the real consignee gets it. In other words, the embargoes that have been placed by the eastern trunk lines are only enforced because the shipping public has attempted to use freight cars as storehouses.

There is another peculiar thing about the embargoes that have been placed and are in effect to-day—that is that they do not apply to less than carload shipments, the most unremunerative traffic that the railroads have, so that less than carload shippers can keep on contributing to congestion and the abuse of cars right in the midst of the embargoes that are placed to relieve the situation.

If the railroads throughout the West could take up the question of embargoes and absolutely stop the promiscuous loading of cars until definite arrangements had been made at the seaboard for exporting the specific shipments, there would be a chance for the ships that are sailing from New York to go forward with full cargoes instead of sailing as they are compelled to do to-day, frequently with only part of a load.

In other words, it is the heavier loading of cars that everybody engaged in the shipping of freight should be interested in thus contributing toward utilizing cars to their fullest capacity.

LARGER STEEL CORPORATION LOADING

In this connection it is gratifying to state that twelve shipping companies of the United States Steel Corporation during the year 1915 showed an average

carload of 77,000 lb. per car. This is almost unbelievable when it is realized that the average carload on all railroads throughout the United States on all traffic, including the steel traffic referred to, was only 42,000 lb. per loaded car, or an average of 35,000 lb. per car less than the record made by the shipping companies of the United States Steel Corporation.

The twelve shipping companies referred to increased the average carload on outbound shipments during the year 1915 only 1800 lb. per car, effecting an actual saving of 26,583 cars, as compared with the loading for the year 1914, when the average was 75,200 lb. per loaded car.

According to the Interstate Commerce reports compiled for the fiscal year 1915, the average haul per ton of revenue freight throughout the country of the individual railroad was 163 miles, and the loaded freight cars per train was 24 cars. On this basis the railroads throughout the United States were saved 4,333,029 car miles, or a saving of 180,543 train miles. The 26,583 cars saved means that these cars were in other service. According to the statistics compiled by the Interstate Commerce Commission, the average freight revenue was 15.32c. per car mile, so that the actual saving of the 26,583 fewer cars used resulted in increased earnings to the railroads of \$663,820, without any increased operating expenses.

NOT DUE TO LARGER CARS

It might appear at first as though the adoption of modern equipment of larger capacity was responsible for this great showing, but there was very little change in the capacity of cars in the two years that are compared. It is rather the result of a persistent determination to utilize all cars to their fullest capacity.

During the last four years, the same twelve companies have effected a saving of 165,696 cars through the heavier loading of equipment.

The shippers, consignees and the railroads have been greatly benefited in the fewer number of cars switched and weighed, to say nothing of the great saving in operating expenses, switching service on 165,696 cars or 331,392 terminal movements, and the expense of handling this additional number of both empties and loads through the various classification interchange yards of the railroads from point of shipment to destination. It proves conclusively the money value of conserving the freight car equipment, not only when there is a severe car famine but at all times.

Germany's High Steel Month of the War

Germany's steel output for January, 1916, according to data of the Association of German Iron and Steel Manufacturers published in *Stahl und Eisen*, was 1,224,732 metric tons—the largest month's total since the war started. The daily rate was 49,029 tons, contrasting with a daily rate in January, 1914, of 60,250 tons. The present rate is therefore over four-fifths of that before the war. The best previous war record was 1,215,287 tons in October, 1915, a daily rate of 47,493 tons. The production in January was made up of the following: Bessemer steel ingots, 598,137 tons; open-hearth ingots, 533,069 tons; steel castings, 71,002 tons; crucible steel, 8230 tons; electric steel 14,294 tons. The Rhineland-Westphalian district produced 696,141 tons, or 43 per cent of the January total.

Manganese Ore and Ferromanganese Imports

Manganese-ore imports into the United States in January were 16,648 gross tons as against 69,274 tons in December, 1915—a decided falling off. The average for 1915 was 26,731 tons per month. For the seven months ended Jan. 31, 1916, the total was 279,282 tons, exceeding those for the same periods in 1915 and 1914, which were 158,560 tons and 178,258 tons respectively.

Ferromanganese imports in February, according to Government figures furnished THE IRON AGE, were 6892 gross tons, which is next to the largest record since Jan. 1, 1915. Over 9000 tons was imported in July, 1915. Of the February imports 4664 tons came through the port of Baltimore, 1617 tons through Philadelphia and 411 tons through New Orleans.

*Traffic manager National Tube Company, Pittsburgh.

NEW FACTORY SIGNAL SYSTEM

Fire Alarm and Individual Call Code Signals— Improved Sound-Producing Devices

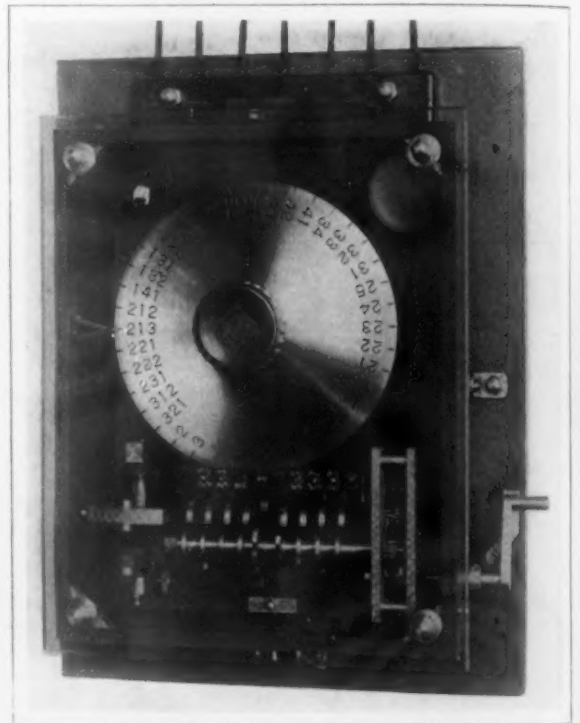
Several large Eastern plants have recently been equipped with a code and signal system that is marked by the compactness and apparent simplicity of the operating instrument and by the pleasant but powerful tones of the horns employed to produce calling and code signals in noisy machine rooms. One of the most recent installations is in the shops of the Spencer Wire Company, Worcester, Mass. The operating instrument is placed beside the telephone switchboard, and twenty-seven horns, fourteen bells and two buzzers are distributed about the plant. As ordinarily used for calling those on the code list, a black button is left pushed in on the top of the instrument, and the signals go out on the horn and buzzer circuit. For fire signals and drills, a red button is pushed in, and with precisely the same method of manipulation the signals go out on the bell circuit. The buildings of the company are divided into zones for fire signals, and the number sounded on the gongs designates the location of the fire. The horns have two opposed projectors and are suspended in any desired location by chains. They are placed so that each effectively covers a large area even in the noisiest rooms of the plant. From the superintendent's office, located in a building some distance from the office building, signals can be sent out over the system by a manually-operated push button. This is only used at hours when the factory is in operation and the general office is closed.

The telephone switchboard operator, when notified that any man on the code list is desired, turns the knob which projects through the glass cover of the instrument, rotating the disk until the man's

number is opposite the fixed pointer. Then the operator pulls down the lever on the right side of the instrument and releases it. At once the whole system of horns sounds the number throughout the plant, repeating it three times. This summons the man to the nearest telephone to call up the operator to find out what is desired. In some plants, bells, buzzers and lights are used in some locations in place of horns.

When the full code system is in use, the first number is the man's key number and the succeeding numbers give definite instructions without making it necessary to use the telephone. This method of using the system can be made very useful and flexible. Thus if No. 2 is given to the master mechanic, his code might be:

- 2—Call telephone operator.
- 21—Go to general manager's office.
- 22—Go to superintendent's office.
- 23—You are wanted in your own office.
- 24—Go to power plant.
- 25—Go to rolling mill.



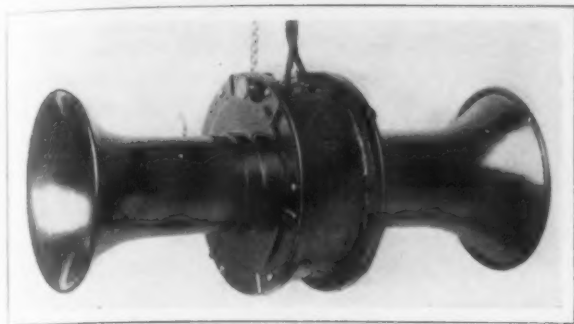
The Master Operating Instrument. The Desired Number is Selected by Rotating the Knob in the Center of the Disk until the Number Is Opposite the Fixed Pointer. The Signals Are Sent Out by Pulling Down the Handle at the Right Side



View of the Apparatus as Installed in the Office of the Spencer Wire Company Showing the Comparative Size and the Usual Position of the Master Operating Instrument

This equipment is called by the manufacturer, the American Model & Instrument Company, Worcester, Mass., the Amico universal industrial code signal system. The apparatus is the result of some three years of development, and, while the system has been installed in several plants for some months, it is only recently that the company has been prepared to furnish a complete standard equipment entirely of its own manufacture.

The operating instrument at the Spencer Wire plant is of the size commonly used. It has a range of forty code numbers, and the entire instrument occupies a space only $4 \times 9\frac{3}{4} \times 11\frac{3}{4}$ in. over all. The materials and construction of the system have been approved by the National Board of Underwriters. The instrument operates two circuits, controlled by push button switches at the top of the box—a black button for regular signals and a red button for fire signals. It has a slate base and box with a bevelled plate glass cover, and its appearance is well shown in an accompanying illustration.



The Amico Horn Has the Feature of Two Opposed Sound Projectors and Double Diaphragms Which Can Be Tuned Through a Wide Range of Sound Volume by Adjusting Screws

Wires and parts on the under side of the base are covered, the grooves filled with compound and the whole base covered with a steel plate. There are two tell-tale lamps, a white lamp operating with all signals and a red lamp operating continuously while on the fire circuit. At the bottom of the base is an auxiliary push button for special signals and tests. The lever at the right of the box, if pulled down as far as possible, sends out the signals three times, but by pulling down one or two notches, the signal will be sent out only once or twice as desired. An intermittent current conveyor draws all arcing to one master contactor and obviates arcing at other contact points. From the operating instrument any form of electrically controlled signal can be sounded—horns, bells (either vibrating or single stroke), lights, buzzers, or steam or air whistles.

The ideal installation is with the standard lighting circuit connected directly through the central station instrument—110-volt 60-cycle alternating current. Extensive experiment has demonstrated that with 60-cycle alternating current, the most efficient tone and volume of sound from horns can be secured. No small part of the development work of the company has been devoted to the designing of horns, bells and relay switches. Installations now in use in various plants are operated by 20-volt storage batteries, 20-volt motor-generator sets, 80-volt 60-cycle alternating current, 110-volt 60-cycle alternating current, 110-volt direct current, and 220-volt direct current. The wiring of the signals is in multiple, permitting ready extension of any line. Should any one horn or bell fail for any reason, the other horns or bells on the same pair of wires remain unaffected. In some of these installations a program clock is made auxiliary to the system. The clock can be cut in anywhere on the circuit, and operates the same horns or bells.

The operating instrument is made in three standard sizes, ten, forty or sixty numbers. The numbers on the rotating disk have been selected so that numbers difficult to read have been eliminated. The forty-number instrument most commonly used can be employed as a simple calling system by which forty different men can be reached, or it can be used as a code system for ten men, to whom definite instructions can be

conveyed by the code numbers. The possibilities of the combinations indicate of course various applications.

The standard horn used on the Amico system is, as the illustration shows, simple and unique in the use of two projectors. The vibration of the diaphragm is regulated by an adjusting screw, which permits a wide range of volume of sound. As the horn hangs free from the walls it sends out sound waves all around and is found free from the overtones which produce disagreeable effects or uneven distribution of sound. The horn for use in most localities uses only 0.05 amp. of current, and 120 horns of this type can be used on a circuit when 110-volt 60-cycle alternating current is employed without any other relay than the one in the operating instrument. For noisier quarters a horn with heavier windings is used which consumes 0.1 amp. This horn, it is claimed, can be clearly heard 300 ft. each way in the winding room of a textile mill. Wall-type horns with a single projector are also built with either the light or heavy windings and corresponding tone values. A smaller horn with two projectors, really a "horn buzzer," has been developed for use in offices and quiet places like shipping rooms.

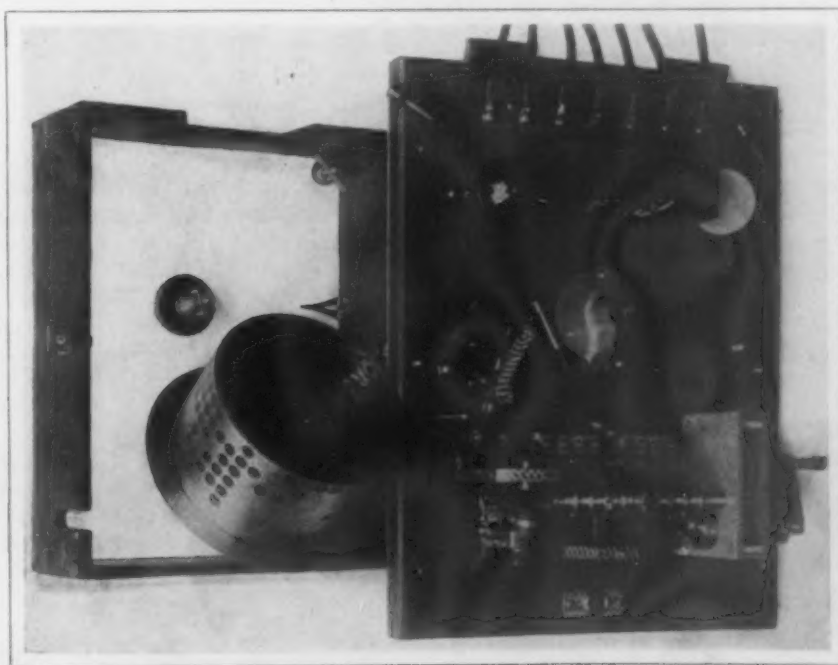
Sweden's Steel Industry in 1915

Swedish pig-iron production in 1915, according to the Swedish Ironmasters' Association, was 767,600 tons; in 1914 it was 635,100 tons and in 1913, 730,300 tons. The open-hearth steel output was 498,400 tons against 407,600 tons in 1914 and 469,400 tons in 1913, while that of Bessemer steel was 90,400 tons in 1915, 93,000 tons in 1914, and 115,800 tons in 1913. Rolled iron and steel output in 1915 was 401,900 tons. On Dec. 31, 1915, 101 blast furnaces were active (65 on Dec. 31, 1914); 155 puddling hearths (134 in 1914); 14 Bessemer converters (6 in 1914) and 60 open-hearth furnaces (45 in 1914).

Iron-ore exports last year were 5,994,000 tons, which compares with 4,681,000 tons in 1914 and 6,440,000 tons in 1913. Ferrosilicon production was about 10,700 tons against 10,000 tons in 1914 and 9600 tons in 1913; but that of spiegeleisen was only 1100 tons again 11,800 tons in 1914 and 2600 tons in 1913.

Iron and steel imports in 1915 declined 8800 tons, or from 238,800 tons in 1914 to 230,000 tons.

All the above production figures are metric tons.



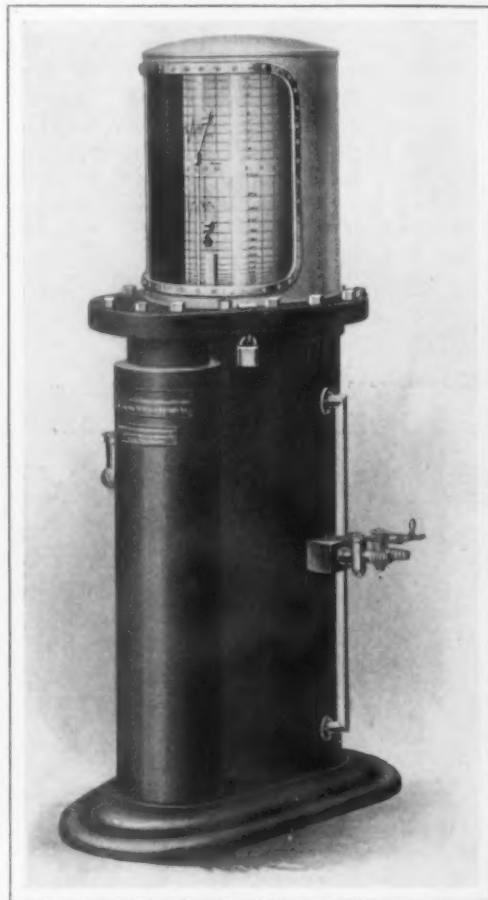
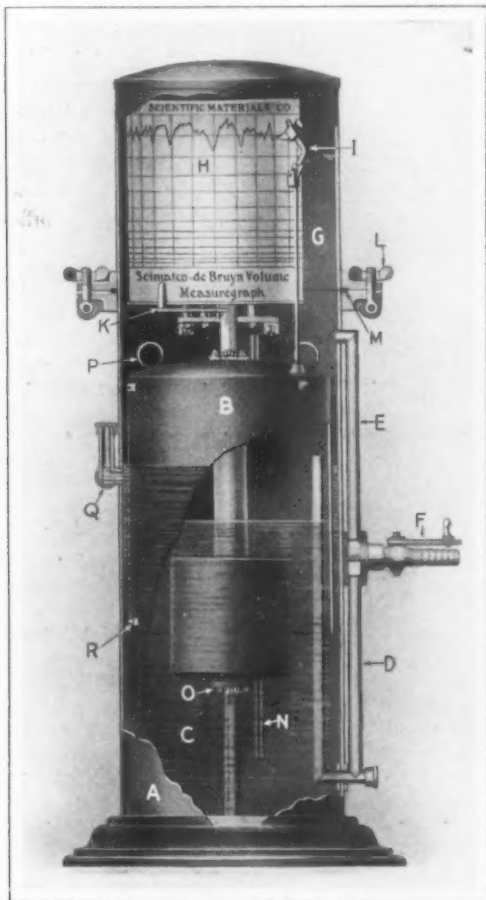
The Master Operating Instrument with the Glass Cover and Central Dial Removed Showing Details of Construction and the Red and White Tell Tale Lamps

Instruments for Measuring Flow of Gas in Pipes

The two interesting instruments shown in the accompanying illustrations have been developed by the Scientific Materials Company, Forbes Street, Pittsburgh, Pa., for giving a continuous record of the volume of gas or air flowing in a pipe line or a combination of both volume and pressure. They are based on experiences in the production and operation of similar instruments made in Germany and in England under various de Bruyn patents, and a feature of the efficiency instrument department of the company. The sectional cut shows the Scimatco-de Bruyn combined gas and air volume

the pressure producing the flow passes inside the instrument to the space within the floating bell, as indicated in the cross-section. Knowing the area of the pipe line and the general character of the gas being moved, the chart is calibrated to read directly the volume moving. The charts may of course be arranged for daily or weekly readings.

One of the features of the mechanism of the instrument is the sensitiveness which may be developed and the scope of pressure differences for which they may be provided. Emphasis is placed also on the simplicity of the mechanism. The pitot tube is of a shape designed to prevent stoppage in cases where unclean gas is being measured. Owing to the fact that there is no flow through the pitot tube



A Double Connection with a Distant Pitot Tube Is Made at F, and the Static Pressure Is Transmitted Through E and the Pressure of the Impact Orifice of the Pitot Tube Is Transmitted Through D. The Floating Ball B with Its Recording Pointer I Takes a Position of Equilibrium Corresponding to the Differential Pressure, Which Is Equivalent to That Causing the Flow in the Pipe Line Metered

measuregraph, while the other shows the exterior of the instrument with the pressure attachment. In the latter case in the one record, both the volume and pressure are recorded.

Briefly described the instrument is put in communication with the two orifices of a pitot tube of modified design and contains an ingenious arrangement of a float by means of which the difference between the static and the impact pressure of the flowing gas obtained by the pitot tube is determined by the position of the float. A pen-carrying pointer of the recording device takes the instantaneous positions against a clock-driven moving chart.

The tube connections are brought to the instrument to a special double-valve so that when the connection is broken both means of communication are shut off and the interior of the instrument is not disturbed. The connection transmitting the static pressure is continued to the space in the upper part of the instrument, while the tube transmitting the pressure corresponding to the static pressure plus

to the instrument but merely a transmission of pressure, difficulties from condensation in the tube line are eliminated and the instrument may be placed at considerable distances from the pipe line under flow measurement. Oil is used for the flotation medium in the instrument, so that with the avoidance of evaporation accuracy of the calibration may be maintained, and the metal parts are either made of non-corrosive materials or are coated or otherwise prepared where necessary to resist corrosion. The floats have a delicate mounting so that they will move up or down under slight pressure changes and at the same time will have little or no lateral movements. The instrument shown for the combined pressure and volume measurement is of gun metal finish with nickel plate fittings and is 42 in. high. The hood can be turned for the observation of the entire chart without unlocking the instrument. It takes a chart 12½ in. in height and the diameter of the drum is 7⅝ in.

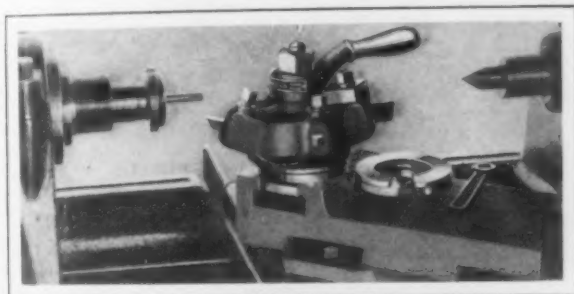
The instrument is of course offered to measure

the flow of blast furnace gas, coke oven gas, and the like. Where dependence for regular operation, as in the burning of a part of the coke oven gas in the ovens, is based on pressure, the combined instrument provides for checking against cases where the pressure alone does not tell the story, as the volume delivered at the desired pressure may be much below the requisite quantity. The instrument can of course be used with an induction diaphragm inserted in the pipe line, if the use of this device is preferred to that of the pitot tube.

A Turret Tool Holder for Lathes

To enable two or more operations to be performed in succession on a piece of work mounted in a lathe, with only one handling, the McCrosky Reamer Company, Meadville, Pa., has provided a special turret tool holder. Two styles are made. The one illustrated can be furnished for carrying a cutting-off tool and three or four square bits. Another is designed for inside work, such as drilling, boring, reaming, etc.

With the holder illustrated it is possible to remove the cutting-off tool and insert another square bit if de-



A Turret Tool Holder for Lathes Using Tool Holder Bits in Place of Complete Tool Holders or Forged Tools

sired. In cases where the fourth tool might interfere with getting up close to the work, the three-cornered tool having two square bits and a cutting-off tool is recommended. The ordinary inserted tool holder bits can be used, as compared with several complete tool holders or forged tools required in some cases, thus effecting a saving in cost. A quick rocker adjustment is provided to regulate the height of the tool.

The holder is attached directly to the compound rest in the same way as an ordinary tool post. In this way the necessity for removing the compound rest and attaching the turret to the cross slide is done away with. The tightening and loosening of the clamping handle operates automatically an indexing device.

The other turret, which is designed for inside work, is attached directly to the compound rest in the same way and the indexing plunger also is operated by the movement of the clamping handle. This turret is furnished with five holes, having a maximum diameter of $1\frac{1}{4}$ in.

Invar and Related Nickel Steels

The United States Bureau of Standards, Washington, D. C., is to issue a series of circulars of information on the properties of the more technically important metals and alloys. The first, describing the properties of the non-expansible alloy invar and other nickel steels, has just been published. The magnetic, electrical, thermal and mechanical properties are given with numerous illustrations, together with statements concerning microstructure, constitution, applications, and sources of supply. The publication is Circular No. 58, entitled "Invar and Related Nickel Steels," and copies will be sent free on application to the bureau.

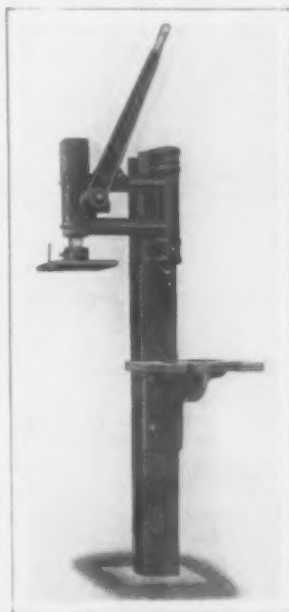
Germans have in recent years acquired 50 per cent of the Swedish iron mines in certain districts, according to a Swedish paper, as well as several copper, zinc and lead mines.

A Hand Squeezer Molding Machine

A machine that can be used for either bench molding or squeezer work, originally designed by the H. W. Cooper Saddlery Hardware Mfg. Company, Moline, Ill., for use in its own plant, is now produced by that company for other foundries.

The flasks it ordinarily handles are 9 x 15 x 15 in. and 9 x 10 x 25 in., but any depth of flask can be used by raising or lowering the molder's bench.

A 5-in. H-beam serves as the standard for the machine, and there are a molder's bench and a swinging bracket containing the squeezer plate. The beam is 8 ft. long and $2\frac{1}{2}$ ft. is bedded in concrete below the foundry floor. A number of holes $\frac{1}{4}$ in. in diameter are drilled in the flanges of the beam for the molder's bench and the bracket for the swinging arm, extra holes being drilled to enable adjustments of the bench or bracket to be made to suit the size of the work and the operator's convenience. The swinging arm is mounted on two 1-in. tool steel centers and turns to either side. Lost motion is taken



A Hand Power Squeezer Molding Machine in Which the Arm Carrying the Squeezer Plate Can Be Raised or Lowered or Swung to Either Side

up by a shoe with a set screw and jamb nut attached to the under side of the bracket and operating against the lower end of the center. The squeezer plate attached to the swinging arm can be raised or lowered approximately 2 in. by loosening the cap screw holding the lever in place. When this adjustment has been made the hand lever is put back in its regular position.

All parts of the machine, which occupies 5 x 5 in. of floor space, are interchangeable, as they are machined by templates. The crated shipping weight of the machine is approximately 400 lb.

Substitutes for Non-Ferrous Metals in Austrian Locomotives

The railroads of Austria, according to *Die Locomotive*, Vienna, have been severely put to it to adapt other materials for uses in which copper and brass were formerly employed. The very large demand from munition and ordnance manufacturers has caused a severe scarcity in materials containing copper. German locomotive builders before the war employed copper and its alloys up to about 4.1 per cent of the weight of each locomotive. Now ingot iron is replacing these metals for firebox sheets and staybolts. The Prussian-Hessian state railroads are stated to have employed as much as 500,000 soft ingot iron staybolts satisfactorily. Brass branch and oil pipes have been replaced by seamless drawn iron pipes and by either seamless or welded gas tubing.

The *Railway Review*, Chicago, states that these substitutes are not surprising, since standard American practice has long since precluded the use of copper and brass to any such extent as practiced abroad.

The Nova Scotia Steel & Coal Company, New Glasgow, N. S., has added to its board of directors N. B. McKelvie, of the firm of Hayden, Stone & Co., Boston. It was decided by the board to proceed at once with the construction of a new blast furnace at Sydney Mines, N. S., to cost from \$200,000 to \$300,000. The company's common stock has been increased from \$7,500,000 to \$15,000,000.

ELECTRIC PIG-IRON FURNACES

Material and Heat Balance Sheets Compared with Those of German Blast Furnaces

Prof. B. Naumann of Breslau takes up in detail the results obtained with the Swedish electric pig-iron furnaces in an issue of *Stahl und Eisen*. He also compares these results with those of modern German blast furnaces, in regard to the material and heat balances. In the course of his introduction he mentions the large Helfenstein furnace at Domnarfvet, built somewhat like a carbide furnace with short compact shaft. When using charcoal as the reducing agent this furnace can work with 6000 to 8000 h.p., but when using coke only with 5000 to 5500 h.p. In the former case it uses 300 to 400 kg. of charcoal and about 2000 kw. hr. per metric ton of iron, and in the latter 300 to 333 kg. of coke and 2400 kw. hr. The efficiency of this furnace, in regard to current consumption, fuel and electrodes, is not yet equal to the 3000-h.p. Elektro Metall Company furnace at Trollhättan, as Helfenstein himself admits.

The first figures given refer to the tests with the small 750-h.p. Elektro Metall Company furnace at Domnarfvet, and are shown in Table 1. No. 1 was carried out with pure Tuollavara magnetite (92.4 per cent Fe, O, and 1.99 per cent Fe, O₂), No. 2 with Grangesberger red hematite (71.65 per cent Fe, O, and 13.75 per cent Fe, O₂), and No. 3 with Grangesberger magnetite (66.34 per cent Fe, O, and 21.21 per cent Fe, O₂). In the first two cases a mixture of almost equal parts of coke and charcoal was used as a reducing agent, in the third coke alone. The current consumption in the first case was 2473 kw. hr. per metric ton of iron, the iron in the charge being 68.45 per cent, in the second case 3286 kw. hr. per ton were necessary, the charge containing 62.50 per cent iron; and in the third case 2954 kw. hr.

For the production of a metric ton (2204.6 lb.) of pig iron the following materials were necessary:

	Kilograms	Pounds
Tuollavara ore	1,330.47	2,932
Striberg ore	58.92	130
Stallberg ore	88.89	196
Limestone	59.67	131
Charcoal	339.88	750
Electrodes	5.19	11.4
Current, kw.-hr.	1,749	

The metallic iron in the three varieties of ore was 66.16 per cent, 53.57 per cent and 50.87 per cent respectively. The average analysis of the pig iron produced was:

	Per Cent		Per Cent
Carbon	3.63	Sulphur	0.008
Silicon	0.35	Phosphorus	0.018
Manganese	0.40	Titanium	0.043

The heat balance is summed up in Table 2.

Table 2—Heat Balance Sheet

Incoming:	Calories	Per Cent
1. Carried in by charge.....	3,049	0.12
2. From the circulating gases....	4,761	0.19
3. Heat of formation of slag, etc.	34,619	1.38
4. Combustion of carbon.....	962,837	38.39
5. From the current.....	1,502,576	59.91
Total	2,507,842	99.99
Outgoing:		
1. For reduction	1,560,915	62.24
2. For expelling CO ₂	34,898	1.39
3. For expelling H ₂ O.....	25,126	1.00
4. Carried away by iron.....	260,000	10.36
5. Carried away by slag.....	61,122	2.44
6. Carried away by dust.....	167	.01
7. Carried away by gas.....	17,916	.71
8. Carried away by cooling.....	194,337	7.75
9. Carried away in the contacts..	143,001	5.70
10. Radiation loss (by difference).	210,360	8.38
Total	2,507,842	99.96

The amount of the incoming heat used for metallurgical purposes is 52.88 per cent, and if the value of the gas is considered 82.80 per cent. The average

Table 1—Heat Balance Sheet per Metric Ton (2204.6 Lb.) of Pig Iron

	No. 1		No. 2		No. 3		No. 3b	
A. Incoming:	Calories	Per Cent	Calories	Per Cent	Calories	Per Cent	Calories	Per Cent
From combustion of carbon.....	1,054,860	33.0	1,167,400	29.1	1,051,000	29.2	2,375,000	84.7
From electric current.....	2,137,910	67.0	2,840,750	70.9	2,553,730	70.8	432,000	15.3
From hot blast .....	...	...	...	...	...	...	...	...
Total	3,192,770	100.0	4,008,150	100.0	3,604,730	100.0	2,807,000	100.0
B. Outgoing:								
1. For reduction	1,662,300	52.1	1,827,700	45.6	1,701,470	47.2	1,701,470	60.6
2. For melting and overheating iron.....	280,000	8.8	265,000	6.6	265,000	7.4	265,000	9.4
3. For melting and overheating slag.....	150,450	4.7	161,000	4.0	126,280	3.5	161,000	5.7
4. Decomposition of water.....	23,790	0.7	90,700	2.3	64,960	1.8	83,030	2.9
5. Heating waste gas.....	29,140	0.9	32,600	0.8	30,800	0.8	200,000	7.1
6. Heating the cooling water.....	472,660	14.8	782,840	19.5	647,400	18.0	168,400	6.0
7. Loss in conductors and contacts.....	155,610	4.9	263,850	6.6	218,200	6.0	...	...
8. Radiation loss	371,620	11.6	451,760	11.3	373,600	10.4	228,100	8.3
9. Remainder (by difference).....	47,200	1.5	132,700	3.3	177,020	4.9	...	...
Total	3,192,770	100.0	4,008,150	100.0	3,604,730	100.0	2,807,000	100.0

per ton, the charge having 53.01 per cent iron. Column 3b gives a balance sheet for a blast furnace smelting magnetite. The amount of the incoming heat used for metallurgical purposes in the four cases is 50.3 per cent, 51.5 per cent, 50.6 per cent and 43.9 per cent respectively, and if the value of the furnace gas is considered 65.1 per cent, 65.1 per cent, 66.2 per cent and 76.3 per cent. This last figure is very unfavorable, as a comparison with more recent records will show.

The remaining figures deal with the results obtained with the larger furnace at Trollhättan, as reported in detail by Leffler for operation from Aug. 4, 1911 to Mar. 6, 1912. Eighteen different runs were made, and one in particular, which lasted for two months, was carefully followed. The balance sheets are based on a part of this run, and are compared with recent results obtained by Gillhausen on a blast furnace. Tables are given of the amounts of materials used, those per ton of iron, the amounts of materials produced and full analyses. Also the various amounts of heats produced and used are carefully calculated in detail.

The average slag analysis was:

	Per Cent		Per Cent
Silica	40.99	Lime	24.72
Alumina	4.90	Magnesia	17.84
Titanic acid	5.58	Calcium sulphide.....	0.045
Ferrous oxide.....	2.67	Phosphoric acid.....	0.008
Manganous oxide.....	2.58		

efficiency for the blast furnace as found by Gillhausen is 49.78 per cent without the gas, and 88.16 per cent with the gas. Properly speaking the electric furnace should be compared with the charcoal blast furnace, for charcoal was used exclusively, but unfortunately there are no reliable figures on this type of furnace.

G. B. W.

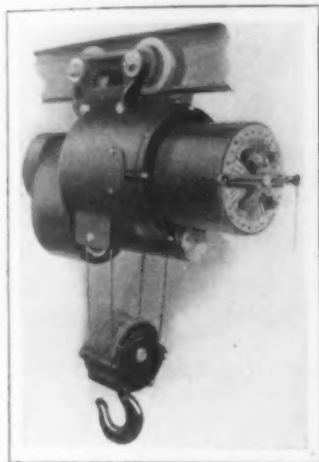
Wider Test Range for Expansion of Metals

By using a bath of pentane, the range of temperatures for determining the expansion of materials has been extended by the United States Bureau of Standards to -150 deg., so that measurements can now be made by the bureau in an oil bath from -150 to +330 deg. C. Rods of very pure tungsten, of cold-drawn 36-per cent nickel steel, or invar metal, and of porcelain have recently been measured for variation of coefficient within this range. An investigation of a large series of copper alloys and brasses is about to be made, both parallel and perpendicular to the direction of rolling.

The annual meeting of the American Electrochemical Society will be held in Washington, D. C., April 27 to 29. Several papers on the electric steel furnace are expected.

An Inclosed Type of Electric Hoist

For use in locations where dust and acid fumes are present and also for outdoor service, the Economy Engineering Company, Willoughby, Ohio, manufactures an inclosed type of electric hoist. All



A Recent Electric Hoist Having a Cylindrical Frame That Completely Incloses the Machinery

the working parts are protected by a cast-iron cylindrical frame and no extra covering is required as protection from the elements. Among the fields for which the hoist is designed are coal handling plants, steel mills, forge shops, pickling houses and similar locations.

The frame, which is a cylindrical casting, is relied upon to furnish the support needed for the machinery, including the drum, brakes and motor, as well as inclos-

ing them entirely. A number of openings give access to the various parts. By removing the steel cover plate the commutator brushes are exposed and when the end frames are removed as well all parts are accessible and any unit can be removed without disturbing any other part. The drum is located centrally within the frame, so that only a small opening is necessary for the passage of the rope and the drum is not exposed. A cast-iron partition separates the section of the frame containing the gearing and the mechanical friction disk brake from the drum and the motor. Cast iron is used for the drum, which is machined and grooved to receive the rope required for a given lift without overlapping. The drum gear is fastened to the end of the drum and not to the shaft. It is pointed out that the drum replaces the motor frame and revolves around the motor armature, thus reducing the over-all dimensions of the hoist and giving a high lift.

Hyatt rolling bearings are used and on account of the comparatively slow movement the drum bearings have bronze bushings. Spur gearing with cut teeth is used, the gears and pinions being turned from the solid and after the teeth are cut the blanks are heat treated and hardened. This was with a view to eliminating all forms of bevel, internal worm or other special gearing. The use of roller bearings and gears running in grease reduces the need of lubrication, but means are provided to lubricate the bearings at intervals. Plow steel rope is used. The load block is a cast frame containing large-diameter sheaves having roller bearings and the hook is a steel forging constructed to swing and swivel on ball bearings.

Any standard direct or alternating current motor adapted for hoist service can be used and either rheostatic or single-speed control can be furnished. The type of control used is furnished in accordance with the requirements of the service which the hoist is called upon to perform. The former type which gives a wide range of speed variation is recommended for foundry service where delicacy or accuracy in handling the load is required, while the single-speed control is designed for handling rough material where the controller is required to stop and start the motor only, the hoist running at full speed. An automatic limit switch is provided to

cut off the hoisting motor when the block reaches the highest position of its travel. An electrical brake operated by a solenoid stops the motor whenever the supply of current is stopped. It is relied upon to hold the load attached to the hoist block in any position.

Any one of several mountings can be supplied for the hoisting unit, the one shown using a plain trolley to run on the lower flange of an I-beam by pushing against the load. This is the type recommended for handling loads up to 2 tons. The trolley consists of two castings connected to lugs on the frame by through bolts, which, when removed, detach the hoist and enable each trolley frame with the wheels to be readily removed from the I-beam. If desired the trolley can be fitted with a hand chain for operation from the floor or a platform for racking, or a similar trolley with spur geared motor drive can be furnished for use on high-speed installations and on long runs, as well as on hoists where the operator's cab is attached. This spur gearing is of the double-reduction type. The hoist can be furnished with the wheels mounted parallel to the axis of the I-beam on which it runs, or with a hook suspension. In addition there are special mountings to suit conditions.

A New California Magnesite Operation

The Sonoma Magnesite Company, Humboldt Bank Building, San Francisco, has recently completed a nine-mile railroad from Magnesite near Guerneville in Sonoma County, about 50 miles north of San Francisco, to its magnesite deposits, located on a tract of some 600 acres. This railroad relieves the company from the difficulties of transportation by motor truck over a mountainous country, and will permit of accelerating shipments on orders, which it is stated call for several thousand tons per month. The company has been incorporated in South Dakota with a capital of \$1,000,000. U. S. Webb, attorney general of California, is president; G. Gibson, Chicago, vice-president; Frank A. Janda, Los Angeles, Cal., treasurer, and Charles Fletcher, San Francisco, secretary. Other directors are C. P. Cutten, W. H. Cobb and H. N. Smith, of San Francisco, and Louis B. Springer, of Chicago. One kiln is in operation, producing 30 tons of calcined magnesite a day, and a second is under construction, with a capacity of 60 tons a day. A grinding machine has been installed, with a capacity of 15 to 20 tons of plastic magnesite a day.

The Beck & Gregg Hardware Company, Atlanta and Savannah, Ga., has issued an artistic brochure commemorating the fiftieth anniversary of the establishment of the house. It has been known successively as follows: 1866, Tommey, Stewart & Orr; 1867, Tommey & Stewart; 1870, Tommey, Stewart & Beck; 1878, Tommey, Gregg & Beck; 1880, Beck, Gregg & Co.; 1883, Beck & Gregg Hardware Company. The officers at present are as follows: Lewis H. Beck, president; William A. Parker, vice-president and general manager; William D. Paden, secretary; Palmer J. Smith, treasurer; William C. Holleymann, manager of purchases and sales.

Ansonia, Conn., is to have a trade school built from funds left by Gen. C. H. Pine, a former resident of Derby, Conn. The State Board of Education has had plans prepared for a three-story building which are now in the hands of the trustees of the fund. Courses in foundry and machine-shop work will be included in the instruction given.

The report of the Commissioner of Industrial Statistics of Rhode Island for 1915 shows that there were 2330 establishments under the workmen's compensation act, employing 154,538 hands. During the year there were 11,611 accidents and 31 deaths, on which the amount paid was \$216,372.30.

How to Reduce the Cost of Belting

Attention to the "Little Details" of Lacing and Dressing Will Lower the First Cost and the Annual Outlay

BY W. F. SCHAPHORST

Belts are expensive when improperly installed or cared for. They are inexpensive when they are correctly installed and receive regular attention. This statement applies alike to leather, camel's-hair, canvas, cotton or any other kind of belting. Paying \$5,000 for good belts is not necessarily good business, if the belts are put up and then allowed to look after themselves. It will be more economical to buy inferior belts for \$3,000, and then give those belts regular attention. Belts of the best quality if not cared for will be worn out and ruined in a year, while the inferior belting will last five or six times as long if they are regularly inspected, cleaned and greased. Of course, the good belting will last longer than the poorer grades with the same amount of care, but poor belts, taken care of, will be more economical than good belts that are neglected.

THE ENDLESS BELT IS BEST

The endless, jointless belt will without question give the best service. Joints are always weaker than the main portion of the structure, be it a steam boiler or a belt. Belts are already full of joints when they come from the manufacturer, but they are so well made that they are seldom considered joints. They are well cemented or cemented and riveted. In making an endless belt, the joint should be made in the same manner as the joints already put in by the manufacturer. If he cements and rivets, the user should cement and rivet. If he depends on cement alone, the user should do likewise.

In order that belts should work the best they must be pliable, laterally as well as longitudinally. On account of the cylindrical shape of the pulleys, the belt must be pliable longitudinally so that it can wrap itself intimately about the pulley. Because of the crown of the pulley, the belt must be pliable laterally. Intimate contact of the belt with the pulley is the secret of sliplessness. If the belt must be pliable, then for good service the joints must be equally pliable. The endless belt is therefore best because it is equally pliable in every direction. Among its other advantages are: its smoothness of running, the absence of noise, the lower danger of slip and of running off the pulleys as compared with jointed belts, and the lower danger of "waves" if the belt is slack.

THE BEST LACED JOINT

The best laced joint, evidently, is that one that most nearly approaches the cemented joint. Paradoxical as it may seem, the best joint should be one that will virtually make the belt endless. It must have an efficiency of 100 per cent.

The ordinary rawhide-laced joint will not give this efficiency, because the use of rawhide lacing requires that a considerable portion of the belt itself be cut away to make room for the lacing. If 20 per cent of the cross-section of the belt be removed for the lacing holes, the efficiency of the joint cannot in any event be higher than 80 per cent. Furthermore, rawhide joints are bulky. Also, they are stiff. As they pass over the pulley, they raise a portion of the belt on each side of the joint from

the pulley face and thus destroy the much-desired intimate contact of belt with pulley. Rawhide joints are noisy, they cause slip, and they are particularly undesirable for use on small pulleys. With large pulleys, the character of the lacing is not so important as regards bulkiness and stiffness.

Neither will the wire or metal-laced joint give an efficiency of 100 per cent. Some of the belt fibers are sure to be broken when the belt is pierced by the sharp metal teeth of the metal lacing or the needle for the wire lacing. The loss of strength is not as great as it is in the case of the rawhide lacing. Compared with the rawhide joint, the wire lacing is almost ideal, from the standpoint of strength of joint. As regards pliability, metal lacings are continually growing better. Many makes are pliable both longitudinally and laterally. The hinge joint is a good example of a highly pliable joint in the longitudinal direction. It is not so pliable in the lateral direction, but still it is pliable enough for all practical purposes.

LACING MATHEMATICS

The above arguments seem to favor the wire-laced hinge joint. The wire-laced joint is also favored by the following analysis of the cost of belting. If the efficiency of the three types of joints which have been considered are taken as

Endless belt.....	100 per cent
Wire lacing.....	95 per cent
Rawhide lacing.....	80 per cent

the corresponding belt widths for transmitting equal amounts of power will necessarily be as follows:

Endless belt, $1 \div 1.00 = 1$
Wire lacing, $1 \div 0.95 = 1.053$
Rawhide lacing, $1 \div 0.80 = 1.25$

For doing the same work, therefore, the relative cost of the belts with the three types of joint will be in proportion to the above figures. If endless belts will cost \$1,000, then we will have to pay \$1,053 for belts if we use wire lacing, and \$1,250 if we use the rawhide joint.

While the belts with the cemented joints will cost \$53 less than those with the wire lacing, it must be remembered that the cost of making the cemented joint is considerably higher than that of making the wire-laced joint. If the belt is to be shortened at more or less greater intervals, as it should be, the facility with which this can be done with the wire-laced joint renders it superior as an all-around proposition to the other.

If in estimating the cost of belting for the plant at \$5,000, as was done at the beginning of this paper, it is probable that the average manufacturer would base his estimate on belts using rawhide lacing at the joints. That is the way it has always been done. But as the rawhide joint has only 80 per cent efficiency, and as the wire-laced joint has 95 per cent efficiency, we could by basing the estimate on the wire lacing find that the belting would cost only

$$\$5,000 \times \frac{1053}{1250} = \$4,220.$$

As a rule belt costs are seldom figured in the above manner, but the process of reasoning just outlined shows that too little attention is given as a rule to the very important factor of belt lacing.

If the selection of the lacing is left to the belt fixer, there is small likelihood that the best lacing will be used. He will take whatever is at hand or what is easiest for him to use. He may, and probably will, if he gives any thought at all to the matter, use large rawhide laces with the idea that large, wide laces make for strength. On the contrary, wide, thick laces weaken the belt. The ideal lace should have no thickness or width, it should have great strength, should be pliable, and should not cut the belt when tension is applied. The ideal lace is impossible of attainment, but the wire lace closely approximates it.

BELT DRESSINGS

With the belt properly put up and the best type of joint in use, the next step is to see that the belt is kept in the best of condition at all times. It must be kept from becoming hard and cracking, and must be made or kept waterproof. It must be kept from slipping; its useful life must be maintained as long as possible by relieving the initial tension whenever possible or by making initial tension unnecessary. A good belt dressing is an essential to these conditions. A belt dressing that temporarily prevents the belt from slipping is not necessarily a good dressing. While it may stop the slipping, it may contain ingredients that will be as helpful to the belt as a treatment with sulphuric acid.

The best advice that can be given regarding belt dressings is: Investigate. Find out where there are some of those famous belts that have been in operation for twenty years in surroundings similar to those in your own plant. Find out how the belts have been treated, how they have been laced, whether or not the pulleys are large or small, whether the belt is tight or slack, what the speed is, the width and thickness of the belts, and the stress per square inch under which they operate. Apply the information so obtained to the belts in your own shop.

We can make belts to-day do more work than we formerly could, because we know more about belt manufacture, transmission design and transmission care. There is no excuse for making the mistakes that our ancestors made because of ignorance and inexperience.

BELT DRESSING MATHEMATICS

In the beginning we purchased \$5,000 worth of belting. On the "dressing side" of our belt ledger let us care for this belting in the following ways:

1. Let us apply a harmful dressing that will put the belts out of commission in one year. Annual cost of belting, $\$5,000 \div 1 = \$5,000$.

2. Let us fail to apply any dressing whatever. The belts may then last two years. Annual cost of belting, $\$5,000 \div 2 = \$2,500$.

3. Let us apply a dressing that will keep the belts in good condition for at least five years. Annual cost of belting, $\$5,000 \div 5 = \$1,000$.

Again we see the importance of small things.

The conditions under which any two belts work are seldom alike, so that it is difficult to give exact figures in a discussion of this kind. But the same kind of logic applies to all belt drives, and in every case the "little things" and small details will be found to be just as important as the "big detail" of first cost.

High-Speed Bench Drilling Machine

A bench drilling machine having spindle speeds ranging from 1500 to 5000 r.p.m. and designed for use in toolrooms and shops handling both experimental and regular manufacturing work has been brought out by the Enterprise Machinery Company, 34 South Clinton Street, Chicago, Ill.

The spindle which has a movement of $3\frac{1}{4}$ in. through a cut-steel rack and pinion is tapered at the lower end to fit standard chucks and will take drills up to $\frac{3}{4}$ in. in diameter. Two bearings are provided for the spindle which has an adjustable stop for use when the predetermined depth of hole has been reached. The thrust of the spindle is taken on a ball bearing.

The table is $7\frac{1}{4}$ in. in diameter and can be adjusted vertically for 4 in., the maximum distance between the end of the spindle and the table being $8\frac{1}{4}$ in. If desired the table can be removed and a V-block inserted to take round stock. The machine is driven by a belt connection to an attached countershaft from which an endless belt running over double flanged idler pulleys transmits power to a two-step cone pulley at the upper end of the spindle.

The over-all height of the machine is 26 in. and the net weight is 48 lb. The crated shipping weight is 70 lb.



A Bench Drilling Machine Operating at Speeds Ranging from 1500 to 5000 r.p.m.

Activity in Electrical Equipment Contracts

Among new orders for steel works equipment recently received by the Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa., some illustrate very clearly the large extensions to existing works and the building of new steel plants that is going on actively in different parts of the country. Contracts taken by the company cover territory from coast to coast. Three are for entirely new steel plants, being for electrical equipment of the new mills of the Baltimore Sheet & Tin Plate Company, Baltimore, Md.; Chattanooga Steel Company, Chattanooga, Tenn., and Llewellyn Iron Works, Los Angeles, Cal. The equipment sold to the Baltimore Sheet & Tin Plate Company consists of two 1200-hp. motors, each to drive six hot mills equipped with Falk gears and Nuttall flexible couplings and one 750-hp. motor geared to 12 standard cold rolls. The contract with the Chattanooga Steel Company calls for one 34-in. blooming-mill equipment, consisting of an 8000-hp. motor and a flywheel motor-generator set which acts as an equalizer. The equipment sold to the Llewellyn Iron Works for its new plant consists of two 800-hp. motors, one to drive a 22-in. billet mill equipped with Falk gears and Nuttall flexible couplings, and the other to be geared to a 12-in. merchant mill, also one 250-hp. motor to be geared to a 14-in. roughing mill.

The Missouri Malleable Iron Company, St. Louis, Mo., recently declined an order for 15,000,000 hand grenade castings for the Allies, not for sentimental reasons, but because it is so occupied with domestic business as to be unable to handle foreign orders.

Electrolytic zinc is to be made at Drammen, Norway, by the Norwegian Zinc Electro-Metal Company. It is to use the Sturbelle electric wet process for zinc extraction and will be operating in the fall of 1916 with an initial output of two tons per day.

The 12-In. Howitzer in National Defense

Utilizing the Experience Gained in Producing European Shells to Benefit This Country—Methods and Machines Employed

BY C. A. TUPPER*

IN the discussion of plans for preparedness against possible foreign aggression, increasing attention is being given in the United States to howitzer shells of heavy caliber. Those designed for 8 and 9.2 in. rifled field guns have already been described, and the natural concomitant of these is the 12-in. shell used in similar field pieces. In fact the developments of the European war indicate that for heavy actions, either offensive or defensive, the 12-in. howitzer, or its equivalent the 30.5-cm. (12.01-in.) gun, is the best adapted to long-range work, except in demolishing armored forts, where the German and Austrian 42-cm. (16.53-in.) howitzers and mortars have been used with signal advantage. As an invading army could not bring armored forts with it and we have none in this country back of the coast defenses—nor probably any strategic reason for them—the attention devoted to heavy field work can most profitably center in the 8, 9.2, 10 and 12 in. calibers.

American experience with 12-in. field guns, as distinguished from naval rifles, has thus far been practically negligible. Fortunately contracts for both ordnance and shells of this caliber are now being executed in various plants of the country and an outline of the work required for the latter will be given in this article.

The 12-in. howitzer shell shown by the accompanying illustrations, which are reproduced from working drawings, was designed for a body diameter of 11.955 in., plus or minus 0.01 in., and an over-all diameter through the driving band of 12.2 in., with only 0.005 in. tolerance. The length of the shell is 3.13 calibers, which would make 37.56 in., but in practice this works out as a minimum of 37.31 in. or a maximum of 37.93 in. The head, whose curve must begin at a point just 14.37 in. below the nose tip, has a radius of 2 calibers, while the inner wall curve is formed on a radius of $2\frac{1}{2}$ calibers. Outstanding features of the design are simplicity, relatively heavy walls and comparatively large volumetric capacity. The last named varies between 1147 cu. in. and 1177 cu. in. The minimum wall thickness, except at the nose and under the driving band, is 2.23 in., but this dimension ordinarily approaches a maximum of 2.28 in. This gives room for a bursting charge of 65 lb. The empty body, with base plate, weighs approximately 666 lb., the driving band 14 lb. and the complete fuse $45\frac{1}{2}$ oz., making a total of 750 lb. From this a deviation of only 12 oz. is allowed either way, showing the care which must be taken in proportioning and loading the shell. It is a light projectile compared with naval and coast defense shells, which range all the way up to 980 lb.

MACHINING THE SHELL PROPER

The manufacture of this projectile requires heavy tools of rigid design, but in general it proceeds along the same lines as those outlined for the 9.2-in. shell described in *THE IRON AGE*, Feb. 17, 1916. Exceptional pains are taken in the first stages of the work to insure a sound forging billet, to guard against segregation and piping in the ingot, and for

the forging itself thoroughly sufficient equipment and skilled operators are indispensable. In trimming the open end, when the forging has reached the machine shop, allowance is made for a heavy roughing cut on the base which may not, however, be taken until after boring. Across the base, except at the 0.2-in. chamfered radius, the diameter is 11.85 in. when finished. The body is roughed off along the cylindrical section to a diameter of approximately 12.09 in. The length of this cut from the rough base edge is not to exceed 23.64 in. A finishing cut brings the diameter to 11.965 in. or slightly under. Roughing and finishing the nose follows the lines of a regular arc from a shell diameter coincident with the cylindrical section, 11.965 in., to the diameter of the nose end, measuring 2.402 in. across, with 0.01 in. tolerance. The contour of the head, which must be concentric within 0.05 in. of the true longitudinal axis of the body, is formed on a radius of exactly 24 in., as shown by the drawing, giving a liberal curve which is easily followed in machining. Rough and finish boring of the interior can be carried right through what is afterward the threaded seat of the base plate, so as to complete all surface cuts with the exception of the 8.9-in. wide recess in the base itself and the finishing of the throat. The work requires a horizontal lathe type of drilling machine, with either single-point tools governed by a former or else formed tools, the latter being preferable. Finish boring brings the interior diameter of the cylindrical section to approximately 7.46 in. Specifications require this to be exact; but in practice the dimension is subject to a slight tolerance governed by the outside finished diameter and by a wall thickness varying between 2.23 and 2.28 in. From 7.46 in. bore the interior tapers on an arc radius of 30 in. to precisely 2.75 in. at the junction of the removable nose piece or to 1.9 in. if the alternative integral threaded head is used.

The throat, after being bored and reamed to 2.4 in. for the nose bush or to 1.95 for the integral head, is tapped and accurately threaded, 14 to the inch. The order and extent of the operations naturally depend on the type of head used, but they are best performed on machines especially designed for the purpose. If the removable nose bush is ordered, this will be separately manufactured and the finish threading, 16 threads per inch, to mate with the fuse, completed entirely apart from the work on the shell body. The final operation in this case is to insure that no sharp edges exist at the junction of the nose bush and shell body. For the nose bush mild steel can be used instead of Class C metal (brass).

With either head design, only one tommy hole needs to be drilled and tapped and a single set screw provided for. The right-hand thread of this screw is based on 20 to the inch. It has a body diameter of 0.25 in., the same as those used for smaller calibers, with 0.34 in. length, plus or minus 0.005 in.

In examining the nose of the 12-in. shell, the reader who has followed the designs of the 8 and 9.2 in. projectiles, as shown on pages 422-3 of *THE IRON AGE*, Feb. 17, 1916, will have discovered at this point that the same fuse will fit the 12-in. caliber,

*Consulting engineer, Chicago.

thus scoring one more point for interchangeability. As a matter of fact, the specifications on orders for 12-in. shells now in the United States and Canada call in large part for what is known in England as "Fuse No. 100, with gaine," weighing 45½ oz., being the same as that chiefly used with the smaller shells mentioned.

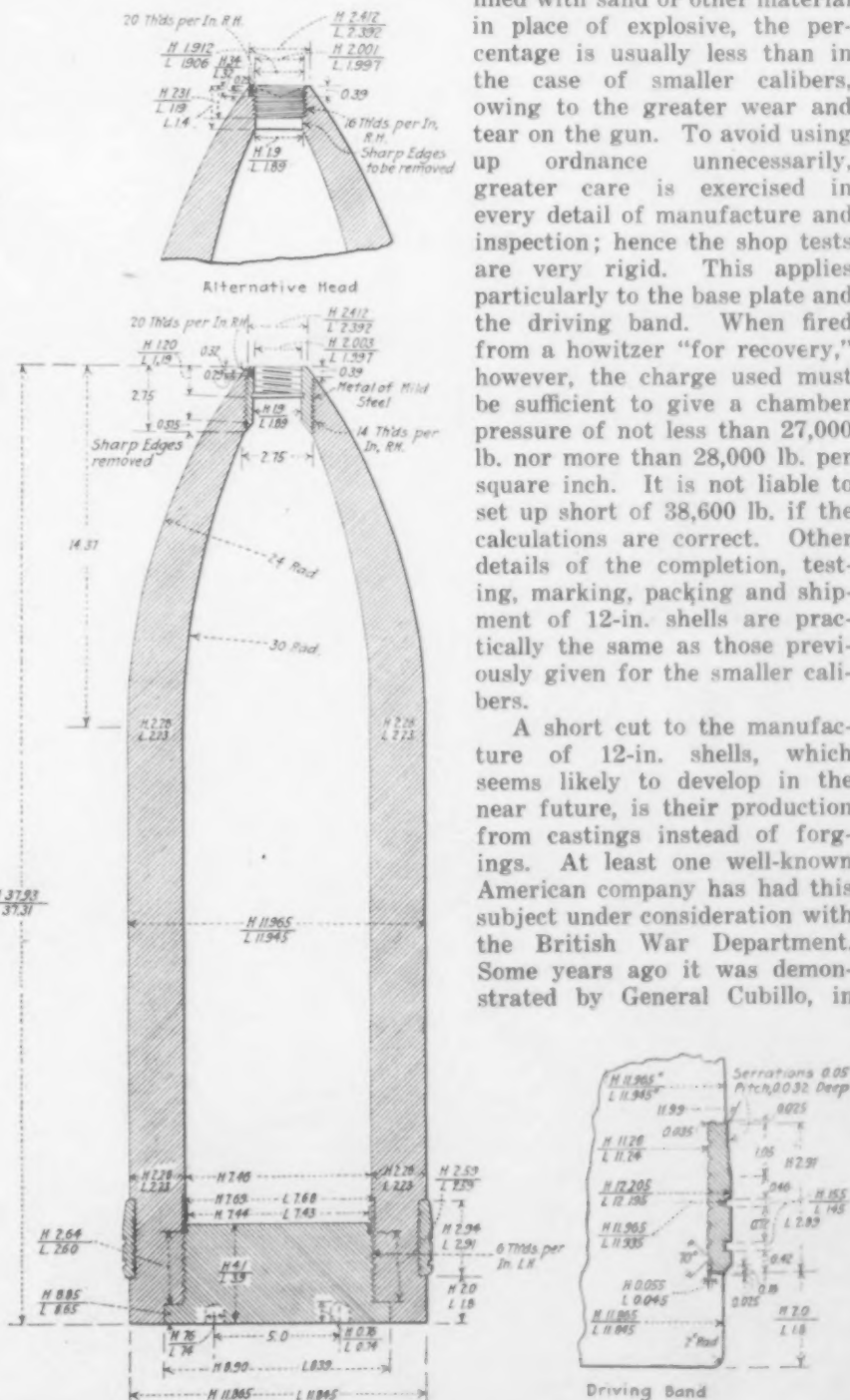
The massive design of the base plate and liberal area of its shoulder will be observed from the drawing. It extends 4 in. into the cylindrical bore of the shell and a recess 0.875 in. deep is cut for the shoulder, tolerances being 0.1 and 0.01 in. respectively. The coarsely threaded section, 16 threads to the inch, takes up 2.60 to 2.64 in. of the 4-in. depth. For the bottom of the base plate, which consists of the usual cross-grained forging, a diameter of 8.3 to 8.8 in. is specified, and its top diameter, above the threaded section, must be approximately 7.34 in. If the base plate is manufactured by an outside plant, the finish boring and base recessing will naturally be governed by the exact dimensions of this plate, so as to insure a close fit. The cutting and threading operations necessary for mating can be well done with special machines, although automatics are very successfully used for the base plate. The bottom of the latter, before being put in place, is indented for a ¼-in. center, and two ¾-in. holes are drilled on a radius of 2.5 in. After being coated with Pettman cement and screwed in, the plate is faced off smooth and the edge chamfered on a 0.1-in. radius. The relatively heavier loading of this shell, as compared with smaller calibers, shifts the center of gravity to a point which places the driving band comparatively high, its lower edge being 1.8 to 2.0 in. above the base.

The cutting of the band seat, which is usually done immediately after the turning of the body, takes place with the usual roughing and finishing to a depth of 0.7 in., over a width of 2.9 in. At either side the bottom is undercut 0.25 in. The drawings plainly show this design and also

that of the eight ribs, which are cut on a 70-deg. angle and 0.3275 in. between centers, with twelve waves in the circumference of each. Three chisel cuts made across the ribs permit escape of air when the copper band is being forced into place. This band, formed from strips or rings accurately cut, is forced into place by a low-set hydraulic press and profiled on a lathe as indicated by the drawing. A mean windage over the body of 0.045 in. is allowed for, the same as for 8 and 9.2 in. shells. The maximum thickness of the copper, broken by two 0.15-in. annular grooves, is about 0.96 in., tapering off at the upper end to a thickness of 0.70 in. The latter section, 1.05 in. in width, has serrations as usual of 0.05-in. pitch and 0.032 in. deep. Profiling differs materially from that of the 9.2-in. shell but follows the same general lines as the 8-in. shell, except for two annular grooves instead of one.

While a certain number of 12-in. shells are taken to be tested by firing from a field piece, after being filled with sand or other material in place of explosive, the percentage is usually less than in the case of smaller calibers, owing to the greater wear and tear on the gun. To avoid using up ordnance unnecessarily, greater care is exercised in every detail of manufacture and inspection; hence the shop tests are very rigid. This applies particularly to the base plate and the driving band. When fired from a howitzer "for recovery," however, the charge used must be sufficient to give a chamber pressure of not less than 27,000 lb. nor more than 28,000 lb. per square inch. It is not liable to set up short of 38,600 lb. if the calculations are correct. Other details of the completion, testing, marking, packing and shipment of 12-in. shells are practically the same as those previously given for the smaller calibers.

A short cut to the manufacture of 12-in. shells, which seems likely to develop in the near future, is their production from castings instead of forgings. At least one well-known American company has had this subject under consideration with the British War Department. Some years ago it was demonstrated by General Cubillo, in



The 12-In. British Howitzer Shell Weighing 750 Lb. with Details of the Alternative Head and the Copper Rifling Band. The Many Contracts Executed in the United States for This Particular Size of Shell Render Its Adoption for National Defense Comparatively Simple

charge of the government arsenal at Trubia, Spain, that a shell blank fulfilling requirements could be cast in its approximate final form, subject only to a limited degree of machining. It has been well proved that a metal free from segregation and piping derives its physical and mechanical properties chiefly from its chemical composition and the subsequent heat treatment. If, therefore, the steel founder can be relied upon to produce a sound metal, it naturally follows that forging may be dispensed with for the object of forging is not only to give the shell body a shape appropriate for the roughing cuts but also to transform the crystalline structure, due to casting in metal ingot molds, into the fine-grained, amorphous structure necessary to meet the specifications for the projectile. The subject is one which has lately been pressing for attention; and its practical working out will have an important influence upon American plans for preparedness, particularly with reference to 8 to 12 in. shells. Facilities in the United States for "forging" or, more properly speaking, the piercing, drawing and forming of heavy projectiles, are comparatively limited. If, therefore, the resources of our numerous steel foundries can be drawn upon by the Federal Government in case of need, it will go far to help in bringing about adequate national defense.

Customs Decision

STEEL BOWS

The Board of General Appraisers has taken adverse action on a protest filed by Hensel, Bruckmann & Lorbacher, New York, regarding the rate of duty on merchandise described on the invoices as "plain forgings of tungsten steel." The custom house authorities returned the merchandise as steel bows magnetized, and assessed duty at 20 per cent as manufactures of metal not specially provided for. The contention of the importers was that the goods were properly dutiable at 15 per cent under paragraph 110 as "pressed, forged or stamped alloy steel." Judge Fischer, who wrote the decision for the board, said that the general appraisers did not think that the proof offered on the part of the importers was sufficient to overcome the testimony of the customs examiner who passed the merchandise in question. The examiner stated on the stand that on examination he found the bows in question to have been magnetized. Moreover, it appeared that the bows were made from bars of steel which had been cut accurately to the proper dimensions and then bent into the proper shapes. The board concluded that the merchandise, so far as the tariff was concerned, was "manufactures of metal," the collector being affirmed.

A Rolling Mill in Uruguay

Uruguay is to have a mill to roll steel billets into merchant bars and small shapes. It is to be located at Montevideo and contracts are said to have been placed in Pittsburgh for an 18-in. train of rolls and other equipment. The project has been developed by Albert Voulminot, formerly an American Bridge Company representative in South America, but recently in the machine and foundry trade in Uruguay. The government of Uruguay is to furnish half of the financial backing.

The annual general meeting of the Institute of Metals (British) was held in London, March 29. Among the papers was one by Prof. A. Stansfield on "Electric Furnaces as Applied to Non-Ferrous Metallurgy" and one by Elliott Cumberland on "The Electrolytic Method of Preventing Corrosion," as well as a "Note on Some Tin-Aluminum-Copper Alloys," by Prof. A. A. Read and R. H. Greans. The next annual May lecture will be delivered May 4 by Prof. W. H. Bragg, a Nobel prize recipient, on "X-Rays and Crystal Structure, with Special Reference to Certain Metals."

LARGE ELECTRIC MINE HOIST

Notable Installation of the North Butte Mining Company, Near Butte, Mont.

What is probably the largest electrically driven mine hoist in the United States is at the Granite Mountain branch of the North Butte Mining Company, Butte, Mont. This hoist operates at very high hoisting speed, and while the loads handled by it are not the largest, the combination of the load with the high speed makes it a machine of considerable interest. The hoist was described by Frank Moeller in a paper prepared for the New York meeting of the American Institute of Mining Engineers in February, 1916.

The conditions which the installation was required to meet were as follows:

Weight of rock to be raised per trip.....	15,680 lb.
Weight of skip.....	8,000 lb.
Weight of cage.....	1,000 lb.
Maximum depth of hoisting.....	4,000 ft.
Diameter of rope.....	1½ in.
Total weight suspended on one rope from drum.....	42,000 lb.
Normal hoisting speed.....	2,700 ft. per min.
Maximum hoisting speed.....	3,000 ft. per min.
Desired capacity.....	200 tons per hour from 4,000 ft. depth

The equipment comprises a first motion hoist with a motor-generator fly-wheel set. The hoist consists of two drums, each 12 ft. diameter by 9 ft. 4 in. face, grooved to hold 5000 ft. of 1½-in. rope in two layers. The drums are mounted on a shaft supported in three bearings, this shaft having a flanged coupling to connect to the motor. The clutches and post brake are operated by oil cylinders, the pressure being supplied by an accumulator and an electrically operated pump. The band brakes are operated by a hand wheel. Control and reverse levers are separated, but interlocked so that when the control lever is in the "on" position, the reverse lever cannot be moved. The clutches are designed to take a load of 50,000 lb. on a 12-ft. diameter, with a factor of safety on all parts of not less than 8. The clutches are of the flat friction type and consist of two heavily ribbed annular rings, faced with wood supported on a single armed spider keyed to the shaft. The rings clamp a flat steel plate bolted to the drum and are moved by six sets of toggle arms connecting to a sliding sleeve and rock shaft operated by an oil cylinder. The post brakes are made of plates and angles in the form of a box guide. They are of the parallel acting type, applied by weights and released by oil cylinders. The band brakes are for emergency service and are operated by hand wheels and screws, with provision for operation by power later on if desired. All of the brakes are lined with basswood blocks. The combined weight of the drum shaft with two drums and two clutches is 30,000 lb.; the radius of gyration is 4.86 ft.

The safety devices include: 1. A mechanism for moving the control lever to "off" position when the skip has reached a predetermined point, holding the lever in this position until the reverse lever has been moved to the opposite position. The operator is thereby prevented from starting in the wrong direction. 2. Two solenoids which automatically apply the post brakes if the skip is carried too far after the current has been shut off. An indicator with a large dial is provided for each drum. For accurately spotting the skip or cage the brake rings on the drums next to the middle bearing are extended 8 in., affording a large surface on which to paint marks.

The electric equipment consists of an 1860-hp., 550-volt direct-current, direct-connected hoist motor operating at 71 r.p.m. and directly connected to a generator of equivalent capacity which is driven by a 1400-hp., 505-r.p.m. motor. A 100,000-lb. flywheel is mounted between the motor and the generator of the motor-generator set. The flywheel is turned smooth and inclosed in a steel case to reduce both the windage friction and the noise. Both the hoist motor and the generator are designed to carry high overloads.

The Inter-Mountain rate case has been reopened by the Interstate Commerce Commission. Hearings will begin April 24.

STRUCTURAL ALLOY STEELS*

Application to the Automobile—Value Due to Heat Treatment—Modulus of Elasticity

Structural steels are working great improvements in the production of structures for various purposes, especially where the saving of weight or increase of strength or both are important, the most conspicuous example being undoubtedly the automobile industry. Heat-treated alloy steels with double or treble the strength of the simple steels they replace and with as great or greater reliability are now in regular and most advantageous use. In common with other alloy steels, structural alloy steels owe a part of their superior properties to the presence of the alloying element, but usually far more to heat treatment when it can be given to them. In automobiles the use of alloy steels is generally not advised unless the steels are heat treated, as the gain from their use in the natural or untreated state does not compensate for the increased cost.

Most structural alloy steels are therefore used in the heat-treated condition, when the articles made of them are, like automobile parts, not too bulky or massive. Large pieces like nickel-steel rails and nickel-steel members of bridges are used without heat treatment, the advantages of increased strength and ductility that the metal possesses being due solely to the presence of the alloying element.

HEAT TREATMENT OF LARGE SECTIONS

The difficulties attending the heat treatment of large steel parts that are bulky for their weight are holding back their general introduction. They require, as nearly as is practicable, to be uniformly heated, uniformly cooled in quenching, and afterward, when cold, to be made true to form, as the quenching operation, however carefully done, usually leaves them warped or twisted. No doubt, in time, means will be found to overcome these drawbacks and such pieces as rails and bridge members of alloy steels will be used regularly in the heat-treated condition.

A compact object like an armor plate, though very large, may be quenched without unmanageable warping because of its simple shape. The difficulty in making straight and true such an article as a heat-treated rail of pearlitic alloy steels lies largely in the springiness of the treated metal. It is not easy to give it the correct amount of set needed to counteract or obliterate a crook, bend or twist that may result from quenching. Yet this is necessary when the piece must be straight or true to shape. Stretching slightly beyond the elastic limit, as is done to some thin steel sheets and relatively small bars to straighten them, might be efficacious, but is not to be easily done with a piece of such irregular cross section as a rail.

The effects of heat treatment are so great that a certain steel may be given a very wide range of properties, depending on the treatment, and any desired set of properties within that range may be obtained solely by varying the heat treatment. The principal variant is the degree of the second heating. The lower this is, the stronger and stiffer the steel, and the higher, the weaker and more ductile it is.

VARIED EFFECT OF HEAT TREATMENT

This effect of heat treatment on steel is illustrated by a table published by a producer giving the results of 40 tensile tests made from one heat of steel, each

Table 1—Results of Tensile-Strength Tests of Five Pieces of Steel Each Receiving a Different Heat Treatment

Tensile Strength, Lb. per Sq. In.	Elastic Limit, Lb. per Sq. In.	Elastic Ratio, Per Cent	Elongation in 2 Inches, Per Cent	Contraction of Area, Per Cent
84,850	50,500	60	28	67.5
120,975	90,000	74.5	14.5	51
166,950	157,500	94	12.5	44
205,600	200,000	97	13	48.7
240,975	225,000	93	9	20.5

*Extract from a Bulletin on the "Manufacture and Uses of Alloy Steels," prepared for the U. S. Bureau of Mines by Henry D. Hibbard, consulting metallurgist.

test piece having had a different heat treatment. Five which cover the range, are given in Table 1.

Analysis of the original steel showed carbon, 0.25; manganese, 0.50; chromium, 1.07, and vanadium, 0.17 per cent, but similar results could be obtained with a variety of compositions.

For making small parts that must be true and well finished the structural alloy steels are generally heat treated before they are machined, and this requirement prevents the use in such parts of steel of the highest strength attainable because steel having that strength is not commercially machinable. Generally speaking, any part that is to have an elastic limit of more than 100,000 lb. per sq. in. must be treated after having been machined, not before, because most steels having a higher elastic limit than that are too hard to allow machining by commercial processes, though chrome-vanadium steels with an elastic limit of 150,000 lb. per sq. in. are claimed to be machinable, that is, they may be cut with high-speed steels at a profitable rate. An elastic limit of 100,000 lb. or more per sq. in. can be imparted to steel only by heat treatment, as no untreated steel of a commercial grade will have so high a limit.

Some of the makers of structural alloy steels are publishing for each of their steels a graph showing the physical properties the steel will have when hardened and then drawn to different temperatures. Of course, the graphs give ex parte information which is subject to confirmation before acceptance, but the plan is excellent as giving the most information in the least space. Similar graphs of many alloy steels prepared by consumers are expected to be soon available for comparison. From these graphs a new user of these steels may choose the properties he desires and specify the steel he wishes, making some allowance of course (say 10 per cent) for the uncertainties of manufacture and treatment. The steel maker or treater, to be reasonably sure of meeting the requirements, will aim to exceed the properties specified, and the net result will usually be that the steel will have practically the properties desired.

RELATION BETWEEN MASS AND QUALITY

The size or massiveness of the article has a great effect on the results obtained by any given heat treatment. The greater the mass the lower the qualities, though not in exact proportion. Thus the mass must always be considered in connection with the properties desired, and the composition and heat treatment prescribed must be modified accordingly, though even then the effect of mass may be only partly compensated for.

The modulus of elasticity of many, if not all, structural alloy steels in common with other steels is not changed much by heat treatment or variations in composition and is usually between 28,000,000 and 30,000,000 lb. per sq. in.; that is, the modulus of the steel in its annealed, hardened and tempered condition remains practically unchanged. Table 2 was compiled from data given by Landau.

Table 2—Moduli of Elasticity of Some Alloy Steels
Composition of Steel—

Carbon, Per Cent	Silicon, Per Cent	Manganese, Per Cent	Phosphorus, Per Cent	Sulphur, Per Cent	Chromium, Per Cent	Nickel, Per Cent	Vanadium, Per Cent	Modulus
0.50	0.13	0.82	0.01	0.02	1.25	...	0.14	29,240,000
0.47	1.83	0.70	0.01	0.01	...	...	...	28,950,000
0.48	0.16	0.44	0.01	0.01	0.98	2.02	...	28,840,000
0.30	0.19	0.64	0.01	0.01	...	3.25	0.18	28,260,000
0.25	0.21	0.74	0.01	0.01	...	3.55	...	28,170,000
0.24	0.21	0.46	0.01	0.02	0.96	2.02	...	28,200,000
0.25	0.16	0.50	0.01	...	1.05	...	0.16	30,158,000

Because of the unchangeability of the modulus of elasticity the stiffness or rigidity of steel within the elastic limit is not changed either by heat treatment or the presence of any of the alloying elements, except perhaps manganese in manganese steel and nickel in high-nickel steels.

Heat treatment does increase the elasticity, however, so that a piece of heat-treated steel may return

to its original form after having endured a stress that would have permanently deformed it in its untreated condition; that is, it is given some of the springiness of heat-treated springs.

Many of the structural steels, particularly those

used in automobile manufacture, have a great endurance against fatigue when subjected to repeated alternating stresses. The heat treatment increases their durability in this test even more noticeably than it does the properties determined by the tensile test.

The Use of Metal Briquettes in Cupolas

German Research to Determine the Effect on Properties of Cast Iron—The Reactions in Melting

An extensive German research has recently appeared on the influence of the addition of briquettes, composed of borings and turnings of iron or steel, upon the operation of melting iron in a cupola and upon the quality of the resulting iron—an especially interesting topic at present when borings and turnings are so plentiful and are being used on a larger scale than ever before in the charge for blast furnaces. The work was done by F. Wüst, in collaboration with F. Bocking and J. C. Stork, and the details, covering an exhaustive series of experiments and investigations, are published in *Ferrum* to the extent of 122 pages. The summary and conclusions are as follows:

In order to ascertain the effect which the addition of briquettes of borings and turnings of iron to the charge of cupolas would have on the metallurgical operation of the melting process as well as on the properties of the melted iron itself, nine melting experiments were inaugurated and carried through, in which the briquette additions mounted progressively from 5 per cent to 25 per cent of the iron charged, while the other conditions were maintained as nearly the same as possible. The operations attending the melting process as well as the changes which the melted product undergoes in its composition were made clear on the basis of seven material and heat balances of the cupola.

In order to determine the effect of the briquettes of borings on the physical properties of the resulting cast iron four sets of test pieces of 20, 25, 30 and 35 mm. diameter from each tapping of the nine melts were poured, which served to ascertain these properties. From proper test pieces the hardness as well as the tendency of the iron to shrink and to become white iron were decided.

In order to ascertain the condition of the finished castings to which such briquettes had been added rectangular hollow castings, with a wall thickness of 30, 40, 50 and 60 mm. and having dimensions of 640 mm. by 1200 mm., were cast from six trial melts, with an addition of none to 25 per cent of briquettes. The hollow castings were cut in two and test pieces machined from one section. The results of the experiments can be understood from the following concise summary:

INFLUENCE ON THE METALLURGICAL REACTIONS IN MELTING

The total loss or waste increases in proportion to the addition of briquettes. For every one hundred parts of briquettes in the charge the melting loss rises 0.072 per cent.

The proportion of iron in the total waste follows the briquette additions which diminish the carbon. As to the silicon, manganese and sulphur definite conclusions are impossible because the effect of the briquettes is disguised by other factors such as the quantity of slag, the temperature of the cupola, etc.

The percentage of loss with reference to the total materials consumed arranges itself as regards single elements as follows:

The loss of pure iron increases to such an extent that for every one hundred parts of briquettes in the charge an increased loss of 0.05 per cent may be calculated.

In the case of silicon the increased loss is very plainly marked, but in that of manganese less so. The augmentation in the percentage loss of carbon is not of

great consequence. An increase in sulphur absorption is not caused by the briquettes.

The temperature of the melted iron increases on an average of about 2.4 deg. C. for every percentage of briquettes. The temperature of the waste gas shows a tendency to mount, but it has no simple relation to the briquette charge. The composition of the waste gas is not affected.

The quantity of pure carbon necessary to melt a ton of iron is increased, though but little. The volume of wind required to melt a ton of iron is as little affected as the volume of gas formed per ton of carbon consumed.

The degree of efficiency of the cupola diminishes as a result of the rising temperature of the waste gas. The melting time per ton of iron is hardly changed.

INFLUENCE ON THE PROPERTIES OF THE IRON

The influence as ascertained from the specially poured test pieces was:

The transverse strength increases and to more than 35 per cent in the case of higher briquette additions. The improvement lessens with the increasing diameter of the test pieces. The upper limit is not reached with the addition of 25 per cent of briquettes in the case of heavy walled material. The bending properties increase.

The tensile strength, especially of the bars of large diameter, is essentially improved to something over 50 per cent. In the case of test pieces of small diameter the percentage of improvement is not so great because the original strength is already in the neighborhood of the attainable.

The dynamic strength or resistance to blows is augmented irregularly, and the hardness increases in a trifling degree. The tendency to shrink is aggravated and the chilling properties favorably influenced.

As to the effect of the properties of the metal in the casting process:

The transverse strength is raised as much as in excess of 40 per cent by means of high additions of briquettes. The bending properties increase essentially with augmented briquette additions.

The tensile strength experiences a decided improvement which amounts to over 40 per cent in castings containing a high percentage of briquette additions. The influence on the dynamic strength or resistance to blows is inappreciable.

CONCLUSIONS FROM THE EXPERIMENTS

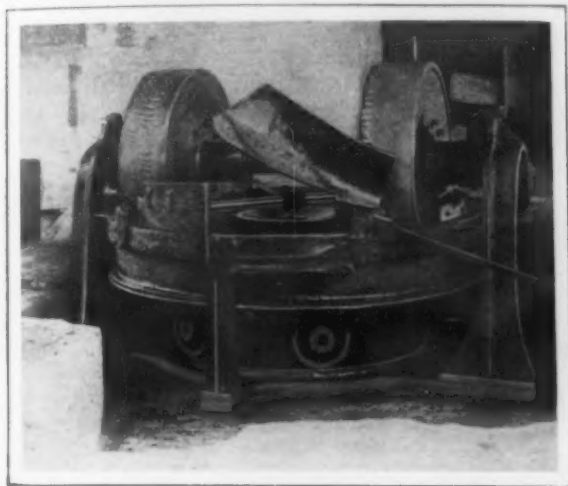
In briquettes of borings an agent is afforded which is suitable for increasing the tensile properties of heavy section castings which as a rule have not sufficient strength whereby, corresponding to the thickness of the castings, the addition of briquettes will augment the strength even more than indicated by these experiments.

A review of the work done in correlating the magnetic and mechanical properties of steel has just been published by the Bureau of Standards, Department of Commerce in its scientific paper No. 272. The substance of this report was given in an article in *THE IRON AGE* of March 30, page 795. The Bureau of Standards will send its review free on request.

GRINDING AND MIXING SAND

New Type of Machine for Preparing Facing for Steel Foundry Molds

Properly preparing facing sand for the molds in steel foundries is highly important. Efficiency and low cost of the process have often been difficult to achieve. The mixture being one of the main sand and some clay and often some used or burnt sand, the whole moistened with molasses



New Type of Sand Grinder for Preparing Facing Sand for Steel Foundries

water or other liquid, its thorough grinding and working into a homogeneous mass has been difficult. This prepared sand is that which is next to the pattern, forming the face of the mold, except for the wash or coating which is put on just before drying. Unless the mixture is thorough, there may often result a cutting of the mold by the very hot and fluid steel, causing scabs or defects in the castings.

The general practice at present in nearly all steel foundries is to grind the mixture in a large circular pan in which two large and heavy wheels revolve, passing over and through the ingredients which are thrown into it by laborers in the proper proportions, one after the other. The thorough mixing is therefore dependent entirely on the machine. With many of them time is lost in repairs and in unloading.

A new style of sand grinder, which is the familiar name of this foundry equipment, has been designed by W. H. Bickley, president and general manager of the Penn Steel Castings & Machine Company, Chester, Pa. As shown by the illustration, it is made entirely of cast steel. All of the "safety first" ideas have been incorporated in the design and it has been approved by the National Founders' Association.

The pan, which is 8 ft. in diameter, is of cast steel. Generally substantial construction keeps delays due to repairs to a minimum and heavy design permits the most severe service. The large heavy wheels are cast steel, slightly fluted to aid in the mixing, and nearly all parts are steel castings rendering the replacing of broken or worn portions very easy. The machine itself is very accessible for such renewals.

A feature of the construction is the special unloading device—the scoop which is elevated in the illustration. By dipping this so that it touches the bottom of the pan, the finished facing sand is

automatically thrown into proper receptacles in front of the grinder. This device is found to be a time saver because of the quickness of its operation.

This mill, operated by two men, produces the same amount of facing previously secured from seven men operating the old style of grinder. Better and more uniform mixing of this sand is also claimed. This sand grinder will easily produce 50 tons of facing sand in 10 hr. It has a speed of 128 r.p.m. and is operated by an electric motor. The automatic unloader requires only a minute to unload a pan of sand. The tires on this machine are so made that they are reversed without inconvenience, assuring uniform wear and long life to these parts.

Small-Unit Turbines vs. Engines

At the annual meeting of the American Society of Mechanical Engineers J. S. Barstow, Philadelphia, presented a paper comparing these two types of prime mover with regard to speed conditions and limitations, steam pressure and temperature conditions, power capacity, relative space requirements, use made of the exhaust steam, available cooling water supply, operating conditions and relative cost of complete installations. The units considered were chiefly the prime movers of auxiliary apparatus in power plants and did not exceed 500 hp. in capacity.

The conclusions drawn by the author are that the turbines are applicable for direct connection to 60-cycle generators of all sizes and 25-cycle generators above 1000-kw. capacity and direct-current generators below that figure, including all sizes of exciter units, for driving centrifugal pumping machinery operating under substantially constant head and quantity conditions where the head is a moderately high one, above 100 ft., and fans and blowers for delivering air at pressures ranging from $\frac{1}{2}$ in. of water to 30 lb. per square inch. In the foregoing cases, the units are operated condensing. The turbine can be used as a direct-connected unit operating non-condensing for all of these purposes and in addition where steam economy is not the prime factor or where the exhaust steam can be completely utilized and oil-free exhaust steam is desirable or essential. They can also be used as geared units, operating either condensing or non-condensing for these applications, and in addition for many others where on account of the relatively slow speed of the apparatus to be driven a steam engine might be used.

The engines can be operated non-condensing, either through a direct or belt connection for driving electric generators of all classes, excepting small-capacity exciter sets unless they are belted directly from the main engine and for centrifugal pumping machinery where the head and quantity conditions vary and the head does not exceed 100 ft. In addition they can be used for driving pumps and condensers delivering water or gases in relatively small quantities and at comparatively high pressures, in the case of the pumps above 100 lb. per square inch and 1 lb. in the case of compressors, and for fans and blowers handling air in variable quantities and at relatively low pressures, not over 5 in. of water column. Other applications are driving line shafting in mills where the driven apparatus is closely grouped and the load factor is good and for all apparatus requiring a reversal in the direction of rotation, as is the case with engines operated for hoisting and traction purposes. As condensing units the engines can also be used for all of these classes, especially where the supply of condensing water is limited and the water must be cooled and recirculated.

The Spring Support & Specialty Company, Cleveland, Ohio, has changed its name to the Great Western Spring Support Company and has elected two new officers, namely, M. A. Bodrick, secretary and manager, and A. E. Conrad, treasurer. M. J. Kilmer remains president.

METAL-WORKING CHISELS*

Heat-Treating Process with Carbon Steel Followed by an English Railroad

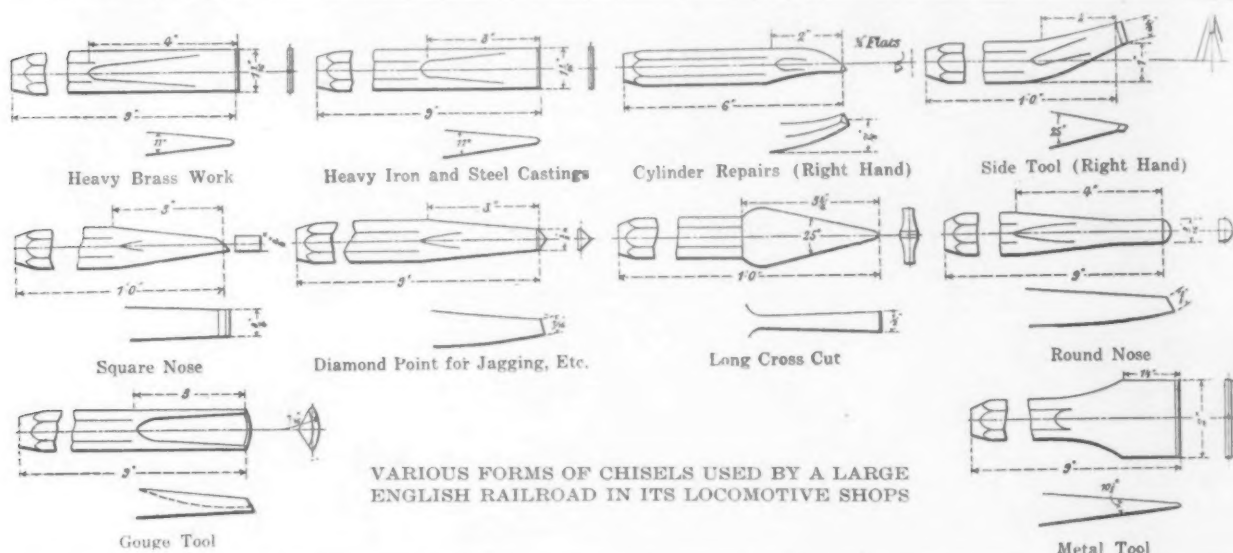
Considerable attention has been given to the composition and treatment of tool steel used in machine tools, but the three implements of the hand-worker, the file, the chisel and the hammer, have been comparatively neglected. Work has been done in testing the first of these and the author knows that there is little need of improvement in the last, but believes that the chisel has not received the systematic attention its importance deserves. That view was confirmed by a close examination of the new and used chisels in one of the railroad shops.

The material usually employed for chisels is not bought to specification, but a well-known brand is purchased. After considerable experiments it was

fired furnace to a temperature of from 1346 to 1364 deg. Fahr., according to the section.

In practice the chisel for heavy brass work shown in the upper left corner is heated to the lower figure, while the one adjoining it on the right for heavy iron and steel castings is heated to 1355 deg. and a 1-in. half round chisel is heated to 1364 deg. because of the varying increasing thickness of the section at the point. When this temperature is reached the chisels are quenched to a depth of $\frac{3}{8}$ to $\frac{1}{2}$ in. from the point in water and the whole chisel is immersed and cooled off in a tank of linseed oil, the oil tank being cooled by immersion in a tank through which cold water constantly circulates.

After this treatment the chisels have a dead hard point and a tough shaft. They are next tempered by immersing them in another oil bath having the temperature of about 419 deg. Fahr. The temperature of the oil is at first reduced, but is grad-



VARIOUS FORMS OF CHISELS USED BY A LARGE ENGLISH RAILROAD IN ITS LOCOMOTIVE SHOPS

decided to order chisel steel having the following composition:

	Per Cent
Carbon	0.75-0.85
Manganese	0.300
Silicon	0.100
Sulphur	0.025
Phosphorus	0.025

A chisel which gave excellent service had the composition given below, but the way in which the steel was heat treated was not known.

	Per Cent
Carbon	0.750
Manganese	0.380
Silicon	0.160
Sulphur	0.028
Phosphorus	0.026

With the decision to specify the composition of chisel steel the form of the chisels was revised and a standard chart of those used in the locomotive shops was prepared. The most important ones are shown in the accompanying drawing and are made to stock orders in the blacksmith shop and forwarded to the heat-treating room, where they are hardened and tempered in batches of 50. A standard system is employed which eliminates the personal element to a large extent. As the chemical composition is practically constant, the temperatures are varied slightly according to the section of the tool. The chisels are carefully heated in a gas-

usually raised to the figure mentioned. The temperature is raised in steps of 3.6 deg., and as the initial temperature is approached the chisels are taken out at each increase in the temperature and tested with a file. At a point between 419 and 428 deg. Fahr. it is found that the desired temper has been reached and the chisels are removed, cleaned in sawdust and allowed to cool in an iron tray.

DISCUSSION

In the discussion, which is abstracted from *Engineering*, Sir Robert A. Hadfield said that, beyond studying the composition of various steels and alloys for work of that kind, he had not paid special attention to the question of chisels. He was interested in finding the author an advocate and defender of carbon steel and bringing forward after a careful test a chisel of plain carbon steel with no special elements present as the best. He believed that greatly improved practice might be obtained by using an alloy steel, and felt that the question of improving the life and work of the chisel could be aided by testing a few special steels. He thought that a chromium steel chisel, having a carbon content similar to that given in the paper or even lower, 0.55 to 0.60 per cent, to which 1 per cent of chromium had been added, would give a longer life. He considered that the treating of 50 chisels at once was the proper way of working and thought that turning tools might be handled with advantage on somewhat similar lines.

In response to a question raised in the discussion Mr. Fowler said that the drawing down of the

*From a paper by Henry Fowler, chief mechanical engineer, Midland Railway, Derby, read at the sixty-ninth annual meeting of the Institution of Mechanical Engineers, London, England, Feb. 13, 1916.

damaged chisels was done in the blacksmith shop and they were then taken to the heat-treatment room, where repairs to the chisels were also made. The workmen have nothing to do with repairs, and if a man had a damaged chisel he would take it to the small shop storeroom and obtain another, the damaged chisel being sent to the heat-treatment room for repairs. There are no grindstones used and just as soon as a tool became dulled even slightly it was turned in instead of being touched up by the workman.

Book Reviews

Indexing and Filing. A manual of standard practice. By E. R. Hudders. Pages xii + 292, 6 x 8 3/4 in.; illustrated. Published by the Ronald Press Company, New York. Price, \$3.

This book presents a vast amount of information upon a subject the importance of which is not appreciated as it should be in the great majority of offices. Filing has become the work of a specialist instead of a job that can usually be entrusted to the office boy. Standardized practice will facilitate accurate filing and improve the work of the file clerk. The present book is an effort to afford those in charge of filing a means of becoming acquainted with standard practice.

The book describes the various systems of indexing and filing in common use and presents the advantages of these systems for particular applications. The scope of the book may be shown by the chapter headings as follows: Terminology and Definitions; Indexes; Rules for Writing Indexes; Rules for Filing Index Cards; Filing of Papers; Direct Alphabetic Filing; Alphabetic-Numeric Filing; Numeric Filing; Geographic Filing; Subject Filing; Lost Papers; Transferring; Central Filing Department; Classing and Grouping of Records; Notation; Information and Data Files; Catalog and Pamphlet Filing; Purchase Records; Sales Records; Credit Records; Filing of Sales Invoices; Filing of Purchase Invoices; Check and Voucher Filing; Filing of Electrotypes and Cuts; Filing Equipment; Filing in Lawyers' Offices; Architectural Filing, and Files of an Accountant.

The book should be of considerable service to the office manager in every large concern, as by means of it he will be enabled to develop a filing system best adapted to the needs of his particular business.

Industrial Leadership. By Henry L. Gantt. Pages xii + 128, 7 1/2 x 5 1/4 in.; illustrations, 9. Published by the Yale University Press, 209 Elm Street, New Haven, Conn. Price, \$1.

Mr. Gantt seldom writes anything that does not give the reader food for deep and serious thought. The present book is no exception to this rule. Compressed in its 128 pages are facts and ideas over which the heads and chief executives of every manufacturing establishment in the United States should ponder. The old order, the day of "drive," is fast passing away. The executive that depends on the methods of drive rather than on those of leadership is passing with it. Those that cannot see that the leader is to take the place of the driver will be crushed under the wheels of competition just as surely as the locomotive displaced the stage coach.

The book is a compilation of a series of lectures delivered before the senior class of the Sheffield Scientific School at Yale University in 1915. It covers broadly the principles of modern methods of management and the increased industrial efficiency that results from their adoption. The titles of the six lectures in the series are as follows: Industrial Leadership; Training Workmen; Principles; Task Work; Results of Task Work; Production and Sales. Necessarily only the briefest and most general treatment is given to each of these highly important subjects, but the reader is left with the desire to learn more.

The book is full of epigrammatic expressions. They are so full of the spirit of the ideas that the author is

attempting to convey that we cannot refrain from quoting a few.

Both employer and employee put a premium on inefficiency.

The authority to issue an order involves the responsibility to see that it is executed.

A wise policy is of more avail than a large plant; good management than perfect equipment.

The possession of wealth, and hence power, does not necessarily fit a man for leadership.

If we would successfully direct the operation of any mechanism, we must have as complete knowledge of the men who are going to operate it as we have of the mechanism itself.

It is just as much the function of our engineering schools to train our industrial leaders as it is that of our military schools to train our military leaders.

That country which as a whole has the best men will surely assert its supremacy in the long run.

Good habits are often quite as persistent as bad ones, and habits of industry acquired under a proper system of training are a most valuable asset to their possessor.

Under a democratic system of government tasks may be set, but the worker must be made to feel that it is to his interest to perform them.

There is in every workroom a fashion, a habit, of work, and the new worker follows that fashion, for it isn't respectable not to.

We have no right morally to decide as a matter of opinion that which can be determined as a matter of fact.

If we allow ourselves to be governed by opinion where it is possible to obtain facts, we shall lose in our competition with those who base their actions on facts.

The reviewer wishes that this book could be read by every manufacturer and every labor leader in the country. The application of the principles that it sets forth would go a long way toward settling most of our labor troubles.

The proceedings of the fourth annual safety congress of the National Safety Council, held at Philadelphia, Oct. 19, 20 and 21, 1915, have been published. The volume is one of no less than 775 pages. Besides the general sessions a detailed report is given of the various sectional meetings, covering the papers read and the discussions ensuing. One of these sessions had to do with the safeguarding of machinery and another to the foundry session, both of which were reported at some length in *THE IRON AGE* at the time of the meeting. Some general round table sessions were held, one on "How to Educate the Workman," and these are included in the proceedings. The sectional reports are obtained also in pamphlet form. One feature of the annual volume is the submission of a study of the members of four types of danger signs executed in colors. The headquarters of the National Safety Council are located in the Continental and Commercial Bank Building, Chicago.

Industrial Survey of Chicago

The Western Efficiency Society, co-operating with the College of Commerce and Administration, University of Chicago, is undertaking an industrial survey of Chicago. Four questionnaires have been prepared dealing with the subjects of purchasing, stock handling, organization and time and motion study, including methods of wage payment. The questionnaires are to be circulated through the medium of personal calls by students of the university, who will receive college credits for their work. The survey is in charge of four committees corresponding to the subjects to be investigated under the general direction of an executive committee consisting of I. A. Berndt, Joseph T. Ryerson & Son, F. W. Simons, Jr., University of Chicago, and H. P. Gould, editor-in-chief of "100%."

The first all-steel aeroplane ever made in Canada, and one of the first ever made anywhere, has just been turned out by the Polson Iron Works, Toronto. A successful flight was made over the city by an aviator who stated that it was the most nearly perfect machine he ever handled, and that it required no adjusting, working perfectly the first time.

In Defense of Scientific Management

Misrepresentations of the Tavenner Bill Preamble Exposed—General Crozier Tells How the Government Would Be Adversely Affected

WASHINGTON, D. C., April 1, 1916.—The hearings this week before the House Committee on Labor on the Tavenner bill, which prohibits time study, the use of the stop watch and other accompaniments of scientific management in Government works, were attended by a number of prominent manufacturers and other advocates of the Taylor and kindred systems. The National Association of Manufacturers and the Chamber of Commerce of the United States were represented in opposition to the bill. James A. Emery appeared for the former organization.

At the opening of the hearing Mr. Emery dissected the bill from a legal standpoint and denounced it as "a drastic penal statute which undertakes to make criminal and to punish by fine and imprisonment acts which in themselves are of an entirely innocent character, but which, from the standpoint of the author of the measure, must either indicate a malicious intent or result in an end so injurious to the public welfare that in the judgment of this committee it has become necessary to attach, even to the employment of these methods by officers or employees of the Government, the heavy penalties herein provided." Continuing, Mr. Emery said:

"One striking provision of the measure to which the mind inevitably turns is the exception from the prohibition of the payment of any premium, bonus, or cash reward, in favor of any 'suggestion resulting in economy or improvement in the operation of any Government plant.' By implication, the exception leaves it open to the Government or to the officer representing the Government to pay a cash reward for any such suggestion if made by an employee, while in the same breath it forbids the doing of certain acts which in the practice and experience of those charged with the direction of the plant have been demonstrated to contribute in the highest degree to improvement and to economy in the operation of the plant.

UNWARRANTED ASSUMPTIONS

"Now, the preamble to this bill is put forth as the brief of its proponents, but I assert that substantially all statements made therein are predicated on gratuitous presumptions that are unproven and unprovable. We deny absolutely that scientific management 'uses a stop-watch for the purpose of timing workmen to ascertain the maximum amount of work possible for the most capable man in a given time,' or to 'make this the standard time in which the work must be done or by any system of premiums or bonuses, together with disciplinary measures sufficiently severe to enforce such standard time as the speed at which all workmen'—or any workman—'must eventually attain.' We deny that 'experience shows that the American workman by his exceptional celerity performs twice the work performed by the manual workers of other countries with the concomitant condition that the ratio of accidents here is from three to four times as high as in other countries,' or that the tendency of so-called scientific management or of time studies, or of bonus features, is 'to aggravate the accident liability or mortality aforesaid and reduce the workmen to a mere mechanical instead of a social and moral relation to his work.' And we deny especially that 'by any stop-watch or time study you are able to determine the time in which work can be done, and do not thereby determine the time in which it ought to be done.'

"With respect to the number of accidents charged to scientific management I respectfully call your attention to the uncontradicted assertion of the Chief of Ordnance of the War Department that the percentage of accidents in Government plants among those working under the premium system is less than those engaged in days' work. This has never been refuted."

Henry R. Towne of the Yale & Towne Mfg. Company said that the organizations which he represented had all studied this subject because of the intimate relation between human efficiency and the results of that efficiency as measured in business of every kind. This matter touches our national interests in every direction, for we are to meet in competition increasingly in the future the other industrial nations of the world.

THE TIME FACTOR FUNDAMENTAL

"This bill," he continued, "prohibits specifically two acts, the making of time studies and the payment of premiums and bonuses. The three great components of cost are labor, material, and overhead or expense account. The ratio of these three elements varies in different lines of industry, but while, on the average, I think they are pretty nearly equal, yet wherever there is a material difference the item of labor is much larger than either of the other two. The tendency increasingly is to get away from payment by time, just as far and as fast as we can, to payment by the piece or its equivalent, whereby the relative efficiency of the different workers is recognized and properly compensated.

"To do this the element of time at once becomes the fundamental factor and you have got to observe it. The stop-watch is only one of the many instruments. The object of its use is to enable compensation to be adjusted more scientifically or accurately and more justly than by any process of guess-work or of rule-of-thumb. Under the old system of piece-work as it began to supersede the simple day work the adjustment of piece rates was a constant source of irritation and friction and of injustice, either on one side or the other, because the rates had to be based originally on guess-work in the absence of recorded data and afterward upon the experience acquired under the rates first adopted. Under that system the inevitable tendency of the workman, if he found that his piece-rate was an easy one at which, if he let himself go to his full limit, he could largely increase his earnings, was to feel apprehensive that soon the employer would cut his piece-rate, as was done repeatedly and in many cases unjustly, so that there was a clash or conflict of interest between the two parties to the transaction.

LARGE WAGES DO NOT INVITE PENALTY

"I wish especially to emphasize the fact that now for the first time in the adjustment between the employer and the employee have we a basis that is not merely scientific and accurate but which is just to both parties and which gives the workman a compensation for a fair day's work and which assures him that the rate having once been fairly adjusted will be maintained indefinitely. In most of the shops where scientific management is in use the piece-rates once ascertained in this accurate way are announced to be permanent and the operatives are encouraged to go ahead and make what wages they can, or what wages they please, with the certainty that they are not going to be penalized if they succeed in making large wages.

"A greatly misunderstood factor in scientific management is the stop-watch. It has been implied here that the use of this device necessarily and always consists in the manufacturer standing with his watch in hand alongside the operator and timing him as to all his operations. That is only true as to experimental work. Necessarily an operative must be employed on these experiments under ordinary working conditions where the operation, for example, is that of a paper machine, a machine costing \$60,000 to \$80,000, and twice as long as this room, where obviously the work of experiment and investigation must actually be made on the machine. But when you come to the great majority of

the industrial operations the great bulk of this experimenting is not done in the presence of the operator at all, because he is not needed and because it is not desirable to interrupt or interfere with him. It is done in an experimental room by the aid of those familiar with the art and industry and with sufficient experience and skill to make these tests and experiments more correctly and intelligently. The experts who are employed for this purpose possess a much greater understanding and skill as to how these matters should be investigated than any casual operator."

Mr. Towne gave the committee a number of illustrations of the manner in which time records are made in planning rooms under the Taylor and other systems and declared that experience demonstrated that labor costs ascertained in this way were so accurate that with few exceptions they did not require to be changed. Few errors were found, he said, and these were almost without exception in favor of the operatives and were usually permitted to stand.

CONCERNING "SPEEDING UP"

Representative Keating questioned Mr. Towne closely as to whether scientific management did not frequently result in overworking operatives and as to whether there was not always danger that employers would "speed up" their workmen.

"There is just the same danger," replied Mr. Towne, "as there would be that an ignorant or an avaricious employer, who thinks he can make money out of his competitor by beating down a wage rate from two to five cents an hour, would attempt to do it. At first he might succeed in some slight degree, for he would get a few workmen out of a job or in need, but you know as well as I do that such a man would not hold his help very long and in the long run he would not prosper. He gets the dregs of the trade instead of the better class of mechanics. I do not believe in low wages, for I know absolutely from a long experience that, as a rule, high wages mean low cost of production."

In answer to a question as to the effect of the bill upon the work of Government establishments Mr. Towne said:

"I make this assertion with absolute confidence that in the course of time, if this better system of adjustment of compensation is forbidden in the workshops of the Government and is not made illegal in the private shops, there will be constantly increasing difficulty in getting mechanics to work in the public shops because they prefer employment in shops where they can get better conditions. Evidence of this has been developed in my own establishment, for when we first undertook to introduce this system we were constantly petitioned by workmen in departments where it had not been installed to let them come in under it or to hasten the work necessary to bring them in, and this will be true in any place where the system is carried out intelligently and fairly and the working people come to understand what it means to them. You must not forget that Frederick W. Taylor, the chief apostle of this new art and science, emphasized all his life as the chief proposition the firm purpose of scientific management, as applied to the compensation of labor, to improve labor's opportunities and labor's rewards."

THE FATIGUE ELEMENT

Sanford E. Thompson, consulting engineer, gave many illustrations of crude methods now used in many lines of work in fixing both piece-rates and payment for day's work and showed how reforms were effected by the introduction of time studies.

"The study of the fatigue element," he said, "is an important part of the general problem of fixing wages and this can only be prosecuted by the use of time studies. We find that where a man fails to do a job in standard time it is rarely his own fault but is more often due to the fact that his work is not properly delivered to him or his machine is not properly adjusted or to some other reason beyond his control. When these adjustments have been made he is usually able to go ahead with satisfaction to himself and to his employer and to do the job in standard time."

Mr. Thompson read letters from employees of several manufacturing establishments where scientific shop management systems have been installed to the effect that, whereas the operatives were apprehensive regarding the system at the outset and did not like it for a while, yet later on they found it in all ways satisfactory, especially in that they were able to do more work and earn higher wages with much less fatigue. Replying to inquiries, he said the scientific systems in one form or another had been introduced into England, France, Germany and Japan. In some of the countries the Taylor system was in use and in all of them scientific systems of some kind were steadily making progress.

Representative Nolan declared that the stop-watch was unnecessary to fix a basis of compensation for workmen and asserted that the molders in the stove industry, with whom as a union officer he had been personally identified, made wage agreements with their employers, "but would not stand for the stop-watch a minute." Mr. Thompson analyzed the wage system described by Mr. Nolan, showing that although the stop-watch was not used the process amounted to practically the same thing but probably lacked the accuracy to be reached by scientific time studies.

Representative Keating asked whether the hours of labor had ever been cut as the result of the installation of scientific management, to which Mr. Thompson replied that the working hours had recently been reduced in two establishments, the Eastern Mfg. Company, of Bangor, Maine, and the plant of Eaton, Crane & Pike, of Pittsfield, Mass.

EMPLOYEES PREFER SCIENTIFIC MANAGEMENT

Henry T. Noyes, a button manufacturer of Rochester, N. Y., urged the committee to investigate the scientific management systems to learn their good points instead of relying solely upon the criticisms of opponents of the systems. "To my mind," he said, "the only question is whether these systems are better than what went before. Scientific management has produced higher wages, shorter hours, and less fatigue on the part of the workers. It is certainly significant that scientific plants hold their men better than others."

"The feeling of the men employed in our plant is excellent, accidents are far less frequent than they used to be and although we take a liberal view of compensation payments, the total is much smaller than before. We employ a physician to examine our people at intervals and our workers are glad to take advantage of this service. When we made our first examination we found 51 operatives whose physical condition was bad, but a more recent examination shows that all but one have decidedly improved and the general health of all our people is better than before. As the result of the installation of scientific management, the wages of our men have gained 90 per cent and those of the women 135 per cent. Our operatives now earn more than any other plant in our industry or in Rochester for similar work."

PIG IRON LOADING AT BETHLEHEM

John R. Dunlap, editor of the *Engineering Magazine*, said that labor unions are wholly consistent with scientific shop management, and in this connection he filed with the committee a brief prepared some time ago by Louis D. Brandeis, in which, in defending the principle of organization as applied to labor, he made a very strong argument for scientific management. Questions between workmen and their employers, Mr. Dunlap said, are more important to-day than ever before in the history of the world, especially as the United States must now prepare for a period of world competition more strenuous than anything the country has ever known. Under such circumstances everything possible should be done to advance the cause of scientific management rather than to prevent its development.

Mr. Dunlap was examined by several members of the committee with regard to illustrations used by Mr. Taylor in one of his books, notably a statement to the effect that in organizing a crew of laborers at the Bethlehem works for the handling of pig iron he had fixed a standard of performance "that only one man in

five could reach," the members arguing that such standards were indefensible. Mr. Dunlap said that in organizing a crew for the handling of pig iron, Mr. Taylor had selected only the very strongest men and had put the smaller and weaker men at other tasks to which they were better suited, with the result that the average member of the pig-iron crew, without unusual exertion, performed the task which not more than one man out of five in the yard gangs could perform continuously without a break-down.

WILLIAM KENT SUGGESTS COMMISSION

William Kent, consulting engineer, told the committee he was the first man to adopt the so-called Halsey premium system, the features of which were communicated to him by F. A. Halsey before the latter made any other use of them. The first test made with this system involved a number of apprentices and resulted in a 200-per cent increase of output. This system, he said, has since been used in Great Britain and elsewhere. Each succeeding scientific system had possessed special merits of its own and the whole science was steadily developing to the great advantage of employer, employee and consumer. Dr. Kent gave numerous illustrations of the operation of the premium or bonus system and also explained further Mr. Taylor's experiment in the loading of pig iron at the Bethlehem plant, which he said was conducted on exactly the same principle that would be followed in the selection of the big Percheron horse for heavy hauling in preference to a lightly built racing animal. As the result of the organization of the pig-iron crew at the Bethlehem plant, the wages of these men were advanced from about \$1.20 to above \$1.80 per day, and men came from considerable distances to seek this employment. Another result was that the big, strong, well-trained pig-iron handlers at the Bethlehem plant were in great demand by other plants.

"The arguments made against scientific management," Dr. Kent said, "are the same that were made years ago against the steam engine, the power loom and more recently against the typesetting machines. Workmen feared there would be less work to do and they would receive lower wages while, as a matter of fact, work has been multiplied many fold and wages are higher than before. Wherever you find an abuse attributed to scientific management, investigation will show that it is the result of the stupidity of the men who operate the system and that it is not attributable to the stop-watch. We are killing men in coal mines and on the railroads, but we do not on that account propose to abandon either the mines or the roads. The longer the system is in use the better it will be understood by both employer and employees, and a step backward at this time would be greatly deplored."

Dr. Kent suggested that a special commission of experts composed of General Crozier, President Alifas of the machinists' union, and a third unprejudiced but experienced man be appointed to consider the matter and make a report, agreeing on all possible points but stating definitely the points upon which they disagreed.

GOVERNMENT WOULD BE HANDICAPPED

General Crozier, chief of the Ordnance Bureau of the War Department, strongly opposed the passage of the bill and denied vigorously the statements embodied in its preamble reflecting upon scientific management. In presenting figures recently compiled from the Watertown arsenal pay-rolls, he showed that a force of 600 men, only part of whom were employed on premium work, earned during January last \$3,304 in extra compensation. The chief complaint of the operatives at Watertown, he said, was that more people were not permitted to work under the premium system and thus earn more money. General Crozier denied that high grade men were not permitted to earn premiums and declared that the proportion of such men was greater than that of low grade employees; in fact, until the Taylor system was installed there was no method at the arsenal of increasing the wages of high class men who were not employed on piece-work. High class machinists, especially, now made good premiums for the first time in the history of the arsenal.

Concerning the charge that men are overworked in

the arsenals under the Taylor system, he said that if there were any truth in the assertion he would be the first to condemn the system, for high pay is not worth what it costs if it tires the men to earn it. Never in the history of this controversy had a man been found at Watertown who said he was overworked. A serious question was raised, he said, as to whether piece-work could be continued if the bill passed. Some friends of the measure expressed the opinion that it would be forbidden. Organized labor, he said, was on record against piece-work.

"This bill," said General Crozier, measuring his words carefully, "makes the payment of premiums a criminal offense. If it becomes a law I shall not order any officer to employ the piece-work system in any establishment. The sheet of ice between the officer in charge of one of our arsenals and fine and imprisonment under this bill is much too thin to justify me in ordering him to take such a risk."

General Crozier added that if the United States should be forced into war the abolition of the Taylor system would heavily handicap the Government. While expressing confidence in the patriotism of American workmen as a class, he said he was convinced that if the Government were powerless to compensate them for extra effort they could not be induced to give a maximum of production and it would not be fair to expect it of them.

Richard A. Feiss of the Joseph & Feiss Company, clothing manufacturer, Cleveland, said he had received a letter from Professor Hoxie, who was the expert employed by the Commission on Industrial Relations, which amounted to a virtual repudiation of the commission's report regarding scientific management. Describing the system as installed in his own establishment, Mr. Feiss said: "There are more than 4000 operations in our industry; many of these, however, are grouped together and as a result of careful study of these operations and the installation of scientific management our people who formerly worked 54 hr. a week are now completing their daily tasks in an average of about seven hours and the whole 800 constitute to-day the finest body of workers in the business. This change in the hours of labor has been made possible by the use of the much abused stop-watch and it is an interesting fact that the complaints that we receive from our employees are almost wholly as to the failure to use the watch on their particular tasks."

Colt's Fire Arms Annual Report

The annual meeting of Colt's Patent Fire Arms Mfg. Company, Hartford, Conn., was held April 8, and the present officers and directors were re-elected. The annual report, as of January 1, was presented by Vice-President William C. Skinner, chairman of the board of directors. The net earnings of the company amounted to \$2,470,944, nearly 100 per cent on the capital stock of \$2,500,000. The net surplus, after deducting dividends of 24 per cent in 1915, is \$1,897,026, against a surplus a year ago of only \$26,000. It has unfilled orders, non-cancellable, of \$22,554,245, sufficient to keep it busy until April 1, 1917. A year ago its unfilled orders were \$2,030,000. The report states that domestic orders have shown a large increase since January 1.

The value of real estate, buildings and machinery was \$882,229 and of cash and investments, \$8,917,262, of which \$6,766,316 was advance payments on contracts not yet fulfilled. During the year new machinery to the value of \$700,000 was bought, of which 90 per cent has been delivered. The average number of employees during 1915 was 1285, and 1977 are employed at the plant now, this force being constantly increased. The company expects shipments this year of \$20,000,000, against shipments in 1915 of \$5,000,000.

The purchasing department of the Cambria Steel Company has been removed from the Oliver Building, Pittsburgh, to the Widener Building, Philadelphia. The sales department of this company is now in the Widener Building, having been removed from the Morris Building, and the treasury and auditing departments will be in the new quarters this week.

Federal Trade Commission and the Complaint of Steel Deliveries

WASHINGTON, D. C., April 4, 1916.—Representative Igoe of Missouri has laid before the Federal Trade Commission the complaint of the St. Louis Iron Store Company to the effect that steel manufacturers are showing favoritism in making deliveries, preferring foreign and domestic customers whose contracts call for high prices over domestic customers who have long standing engagements at lower prices. The commission, following its usual course, has first taken up the question of its jurisdiction in the matter and will defer an investigation of the case until this point has been determined. The commission usually declines to consider cases where the transactions complained of are wholly intrastate. In addition, many complaints, though dealing with interstate transactions, do not present a question embraced within the scope of the commission's activities as defined in the law. In many cases where the complainant undoubtedly has a remedy at law the commission confines itself to calling attention to such remedy.

Following the invariable rule, the complaint presented by Representative Igoe is being treated as strictly confidential and will not be discussed by any of the commission officials. Should the commission decide to take jurisdiction of the matter a formal complaint will be filed and the usual notice served on the defendant parties. Such notices frequently result in satisfactory adjustments and in such cases the commission authorizes no publicity, but if the issue is joined and formal hearings are held the commission's decision will sooner or later be more or less formally promulgated.

W. L. C.

Ready to Sell Domestic Pig Tin

The American Smelting & Refining Company has made an announcement regarding its production of domestic tin from Bolivian concentrates, in part as follows:

This company has constructed a tin smelting and refining plant at Perth Amboy, N. J. The refined tin is now ready for sale. From the experiments made, we feel confident that the tin will be of a quality equal to that of Straits tin. While we expect to produce a tin running 99.90 fine, we probably will not desire to guarantee above 99.80 fine. The tin produced in the experimental run made by the company was used by our Baltimore plant in connection with tinning copper plates, and the quality was reported to be excellent in every way for that purpose. Instead of being a daily seller of this product, we desire to make arrangements with those who feel that it would be advantageous for them to do so, for delivery of a certain fixed amount, or of a minimum and maximum amount, monthly, at a price based upon average quotations. It is, of course, recognized that no such contract as above suggested could be made until the buyers are thoroughly satisfied with the quality of the product.

Early last week the company received a shipment of 8000 bags of Bolivian 60 per cent tin concentrates, each bag containing 150 lb.

J. J. McCabe, manufacturer of the McCabe 2-in-1 double spindle lathe, and dealer in new and used machine tools, will remove his offices April 15 from 30 Church Street, New York, to the eighteenth floor of the Singer Building, 149 Broadway. The change will permit of more spacious quarters, but will not mean a removal from the district where Mr. McCabe has done business for the past 30 years. The McCabe warehouse remains at Tenth and Brunswick streets, Jersey City, N. J., where it has been for years.

The Gifford-Wood Company, sheet steel and structural work, elevating and conveying machinery, ice tools, etc., Hudson, N. Y., will open an office in the Union National Bank Building, Scranton, Pa., May 1. Robert B. Marshall, who has been with the company a number of years, will become the Scranton manager, and the territory covered by that office will be practically the whole of Pennsylvania.

IMPLEMENT STEEL BUYING

Meeting in Chicago Plans to Secure Special Price Consideration of Mills

The present high prices and the possibilities of relief were the occasion of a conference of members of the National Implement & Vehicle Association, held at the offices of the secretary, Chicago, March 30. A committee of manufacturers was appointed to formulate a policy for the association and to wait upon the mills to arrange for material for the coming manufacturing year upon a more favorable basis than going prices represent.

The implement manufacturers believe themselves to be confronted by a situation which has no possible solution on the basis of the present high level of raw material values. All of the advance in the price of their finished product is yet to be made, inasmuch as the machines now being sold were made up from raw materials bought at low prices. Materials contracted for now will not be marketed as finished product until next year, a period of sufficient length to bring a complete change in the market. If the highest prices are paid for raw materials the chance of securing a corresponding price for the finished product, in a low-price market, would be hopeless. And as the implement business is conducted, the mere fact that the high-priced machines might be in the hands of the dealers would avail the manufacturer nothing in the event of a decline in values. On the other hand, should the general scale of values continue until the finished product does come on the market, the farmer is expected to reason that that condition will not endure much longer, and will decline to buy, postponing his purchase until the following year. In short, it is the contention of the implement interests that their business is not one which admits of the extreme variation which conformity with going prices of steel would introduce. In view of the normally dependable character of their business, they are making a plea for special consideration.

The conference also had an extremely important result in the adoption of a new sales policy which requires the dealer to pay for machinery on the same terms as are applicable in other lines of business, a change which will eliminate the long terms which have been a special characteristic of the implement industry.

Crucible Steel Wire Plant

The Crucible Steel Company of America at its Syracuse, N. Y., plant is erecting a two-story steel and brick wire mill as an adjunct to the Sanderson Brothers works. There will be two buildings, an annealing building, 70 x 140 ft., already built, and a wire drawing and pickling building to be erected in the next six months. This unit is designed to produce high-grade crucible tool steel wire for twist drills, taps and needle wire.

The Chas. Fischer Spring Company announces the removal of its main factory and general offices from 88-90 Walker Street, New York, to its new and enlarged plant at 473-485 Kent Avenue, Brooklyn. The Walker Street plant, occupied for a number of years by the company, has been completely outgrown, and a constantly expanding business has made imperative provisions for more extensive offices and manufacturing accommodations. It manufactures and sells springs of every description, patented flexible metal tubing of its own design, speedometer shafting, metal specialties, etc. The company continues to maintain at its former address, 88-90 Walker Street, New York, a well-equipped jobbing shop, office and stockroom for the convenience of the local trade.

The Tyler County Chamber of Commerce, Sistersville, W. Va., has raised \$125,000 in the past three months. It has purchased 116 acres of land for free sites and is looking for small industries that can expand. Low fuel cost, locations on the Baltimore & Ohio Railroad and the Ohio River, and a participation by the chamber of commerce in the stock of such companies are among the inducements offered.

ESTABLISHED 1855

THE IRON AGE

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Published Every Thursday by the DAVID WILLIAMS CO., 239 West Thirty-ninth Street, New York

W. H. Taylor, *Pres. and Treas.*

Charles G. Phillips, *Vice-Pres.*

Fritz J. Frank, *Secretary*

M. C. Robbins, *Gen. Mgr.*

BRANCH OFFICES—Chicago: Otis Building. Pittsburgh: Park Building. Boston: Equitable Building. Philadelphia: Real Estate Trust Building. Cleveland: New England Building. Cincinnati: Mercantile Library Building.

Subscription Price: United States and Mexico, \$5.00 per year; single copy, 20 cents; to Canada, \$7.50 per year; to other foreign countries, \$10.00 per year. Entered at the New York Post Office as Second-class Mail Matter.

Low-Priced or Dear Armor Plate?

After years of muddling, the armor plate question is now clear cut. One Congressional committee after another has built a Government plant—on paper—and then handed the scheme over to the Secretary of the Navy for use in clubbing the armor plate manufacturers into a lower price, though no other great power has bought armor so cheaply as the Government of the United States.

The Senate has just passed a bill providing for a Government plant to cost \$11,000,000. The House Naval Committee has the bill before it. Over against the proposal to expend eleven millions for plant, still leaving the Government without iron ore, coal, limestone or any other of the raw materials of steel manufacture, is put this definite proposition from the Bethlehem Steel Corporation:

In our armor plant—which is useless for any other purpose—we have invested \$7,100,000. That same amount of money invested in a steel rolling mill would have earned profits of \$1,400,000 a year. Yet, that investment in armor plant has produced only average annual gross receipts of \$1,418,993.

In other words, the same amount invested in a commercial plant would have produced as much profit as the total receipts (covering expenses and profit) for armor supplied to the Government.

Our total sales in 1915 were about \$200,000,000, of which the gross amount received for armor plate amounted to but \$3,000,000—not 2 per cent of our total business.

At the present time we can obtain in Europe almost any price we choose to ask for our products; but we have not since the war began raised the price for any ordnance products to the American Government.

We now offer to reduce the price of armor plate for the United States from \$425 to \$395 a ton. The price paid now—\$425 a ton—is less than that paid by any great naval power.

It is said that if our offer is accepted, and the Government plant is not built, the price of armor will soon begin "soaring." That there is no danger of any such contingency, and as an earnest of our policy

We will agree to make armor at the reduced price named, for at least five years; or

We will agree for an indefinite period to make armor at any price which the Federal Trade Commission may name as fair.

While the Bethlehem Steel Company in this proposal speaks for itself alone, it is no violent assumption that if the Government needed an amount of

armor plate in the next five or ten years requiring the operation of all the capacity now existing, it would be able to buy it on the same terms—practically its own price. That price, it need not be said, would not be satisfactory to the manufacturers; it would simply be more satisfactory to get something out of these plants than to have them made useless by the Government's undertaking to manufacture for itself.

Whatever change Andrew Carnegie's views underwent after he ceased to manufacture steel—as to the necessity of a protective tariff, in particular—he has had but one opinion about armor plate manufacture. That was that the building and maintenance of the Homestead plant for that purpose was not profitable, in comparison with other lines of steel manufacture, and was dictated rather by considerations urged by Government officials than by those which dictated his other investments in the industry.

The only answer the Secretary of the Navy has made to the proposal that the manufacturers will supply armor plate at whatever price the Government itself shall name as fair is that he is "afraid of the 'Greeks bearing gifts.'" In other words, he would have the Government enter upon armor plate manufacture, no matter what the cost, and in so doing destroy the values represented in plants whose estimated cost is \$20,000,000. Government-built battleships cost more than those built in private yards. Government-made armor plate may cost \$600, \$800, \$1,000 a ton—all depending upon the political necessities the Government plant is called on to satisfy and the rapidity with which it is turned into a labor union paradise. As the issue is now drawn, Congress has to choose between paying a low price or a high price for the Government's armor plate. Signs are not wanting that members of the House Naval Committee see the question thus clear cut, in spite of some very strenuous efforts to befog it.

Census Report on 1914 Pig-Iron Industry

The Census Bureau, Washington, D. C., has begun to issue preliminary statements of the general results of the 1914 census of manufactures. These are prepared under the direction of William M. Steuart, chief statistician for manufactures. The first to make its appearance relates to

the pig-iron industry. It consists of tabulations of the quantities and costs of the principal materials used in that year by the blast furnaces and the quantities and values of pig iron and ferroalloys manufactured. This presentation comes so long after the period covered that it lacks value from a commercial standpoint. The trade long ago had the figures for the year mentioned, which were complete in every respect except as to values—an uncertain field of exploration into which the American Iron and Steel Institute does not venture. The statistics published by the Institute of quantities of raw material used and of the various products made were as comprehensive as those presented in this publication. It is unnecessary to reproduce the census figures in our columns, as the space thus required can be given to more timely matters. The Census Bureau, in issuing these figures, puts its findings in permanent form for the Government archives. They will there be used for reference largely by persons not connected with the iron trade and therefore not familiar with the splendid statistical work done by private enterprise so quickly after the close of a period covered as to have practical and commercial value.

Comparison is made in this document with the figures of 1909, the previous year for which the Census Bureau made an inquiry. Those who confine their study of statistics to Government publications will imbibe the belief from these figures that the pig-iron industry of the United States retrograded in the five years from 1909 to 1914, as the output for 1914 shows a decrease of 9.3 per cent. It is true that the accompanying comments say that 1914 was a period of marked depression, but no figures are given for the years immediately preceding 1914, when the annual output ran millions of tons higher.

A Half Million-Ton Pipe Mill

The pipe mill the United States Steel Corporation will build at Gary, Ind., will have a capacity of about 500,000 tons a year of finished product. The production of wrought pipe (excluding seamless) was 2,245,532 tons in 1913 and 1,737,704 tons in 1914. Statistics for 1915 have not been published as yet, and no statistics were gathered for years prior to 1913. If the production in 1913 represented 90 per cent of the capacity, an assumption that cannot be far out of the way, the new plant represents an addition of nearly 20 per cent to the capacity, and the undertaking is therefore of prime importance. It was originally announced that a tube plant was part of the Steel Corporation's construction program for Gary, and in view of the large demand for the National Tube Company's products in western territory it might have been expected that the Chicago district plan would be carried out earlier.

It is significant that the project not only does not rest upon any demand for tubular goods that may exist during the war, but cannot even contemplate sharing in any burst of demand for rehabilitation purposes that may come immediately after the war. No contracts for equipment have been let and no construction work has been commenced, yet a year and a half from the time active

work began would be a very short time in which to complete a plant involving ore docks, four blast furnaces, two Bessemer converters, two blooming mills, four finishing mills and ten welding furnaces, with the great array of attendant shops requisite for a pipe mill.

There are several indications that the prospects for expansion in demand for pipe are particularly good. While there are no statistics of pipe production prior to 1913, there are statistics of skelp production. Inasmuch as the output of rails has decreased measurably since 1906, the banner rail year, it is not fair to compare the production of skelp with the production of all other rolled iron and steel, but eliminating skelp and rails the production of rolled iron and steel increased 33 per cent from 1906 to 1913. The production of skelp increased 64 per cent.

The pipe export trade in peace times is very promising. The Government export statistics have separated cast pipe and wrought pipe only since July 1, 1914, one month before the war started, but there is some basis for estimating that, of the exports previously reported, about two-thirds were wrought. On this basis the following table of exports of wrought pipe and fittings is constructed:

1911.....	130,000	gross tons
1912.....	170,000	" "
1913.....	200,000	" "
1914.....	125,000	" "
1915.....	129,969	" "

Thus the export trade was increasing rapidly prior to the war. The exports in 1915 were, however, only two-thirds the exports in 1913, whereas the total iron and steel exports were 29 per cent greater. Wrought pipe is one of the commodities for which there is no war demand, while exports to neutral countries are greatly hampered by war conditions. Thus the fact that the pipe mills of the country are now very busy, and are booking a larger tonnage currently than they are shipping, furnishes promise of a still heavier demand, relatively, when the war is over.

As it is ten years since the last standard Bessemer steel works in the United States had been completed, the announcement that the new Steel Corporation plant would use the Bessemer process has caused some surprise. It is to be noted that both the new plant and the last Bessemer plant to be built, that of the Youngstown Sheet & Tube Company, are in connection with the manufacture of welded pipe. For that product Bessemer steel is recognized as well adapted, and existing threading dies for the most part contemplate the use of Bessemer rather than open-hearth pipe.

New and Old Tools After the War

The many orders for repair parts now coming to machine-tool builders from manufacturers using large groups of machines in making shells have an interesting bearing on what tool builders will have to face after the war. The question is still being asked, Will the market be so glutted with used machine tools that there will be little business in new ones for a long period?

Among the straws which show the drift are the

orders and repeat orders for gears, bushings, bolts, chuck wrenches and other parts which have been placed to the extent of thousands of dollars by individual firms. Ordered as they have been in lots of one to several dozen at a time, it might be assumed that these parts have been deliberately lost or thrown away, but such is not the fact. They have been ruined by strains to which they were never intended to be subjected. In many instances the hard usage has been by labor which not only is unskilled, but which works in a don't-care spirit that would be fatal to any device. Parts are quickly ruined, and inasmuch as it is costly to let the machines stand idle, even for an hour, new parts are ordered.

This is a phase of shell-making to which the majority of contractors probably gave little consideration in making their original estimates. The breaking down of the tools is no reflection on their makers, for the latter invariably built their machines to stand extra pressure and subjected them to the usual rigid inspection prior to shipping. In normal times the parts business is negligible. Examination of machines in some large shell-making plants furnishes undeniable evidence of the extent to which tools have suffered, how far certain parts run out of true, etc., and the conclusion is reached that new and accurate tools will not have much to fear after the war from many of the machines that may be patched up for the market.

If the foregoing is true with regard to machine tools developed by experienced makers in long-established shops, it applies all the more to tools which made a more or less hasty entrance upon the market to meet the war demand.

Our Stupendous February Exports

It had been supposed that high-water mark in our export trade was reached last December, but February was destined to set a new record. The exports of all classes of merchandise in the latter month reached a value of \$409,836,525, surpassing by \$50,000,000 the December figures, which were the highest reached in any previous month. The imports of merchandise also established a record at \$193,935,117. The excess of exports over imports was likewise unprecedented, amounting to \$215,901,408. It is noteworthy that this huge export trade was accomplished in a month of only 29 days and further that it was done while shippers were vociferous in their complaints that the congestion of freight on the railroads running to the seaboard was seriously interfering with their engagements. In view of what the figures show to have been accomplished in February, the question may well be asked what the exports would have been if no obstacles whatever had impeded the railroad and vessel movement.

Greater Resort to Producer Gas

Artificial gas making for industrial uses has been given an impetus in natural gas belts through the unusual demands of high operating activities concurrently with heavy domestic demand in spells of cold weather. Many plants have been embarrassed because of a restriction during cold periods as regards the amount of gas which could be supplied,

and the limitation has virtually caused a close-down in some mill departments for a fifth of the working time since the first of the year. With the pressure on steel mills and factories generally for delivery of manufactured products, the scarcity of gas has been serious.

Thus more than usual attention has been paid to other fuels, with the result that producer gas installations will undoubtedly be commoner than is now the case in natural gas regions. The considerably lower calorific value of the made gas compared with natural gas introduces conditions which may change operating arrangements, but these, it is believed, ought to occasion no concern. There is need of independence of a fickleness of atmospheric temperature and the consequent wide variation in permissible natural gas consumption. It is evident that the higher prices paid by household consumers are an important factor in the recent limitation of the supply to industries.

Strengthen the Tariff Commission Bill

One of our readers makes an excellent suggestion in connection with the bill recently introduced in Congress for the creation of a Tariff Commission. He is a practical business man who, like others, is anxious to see the tariff question removed from politics. His suggestion is that the bill should be amended by the insertion of a clause directing the commission not only to investigate and report to Congress but to report "with recommendations." If such recommendations are then made public, this would perhaps compel even a political Congress to consider them, as to ignore them would undoubtedly awaken a strong sentiment against such a course. If the Tariff Commission should merely make investigations for the consideration of Congress, the results of such investigations would in all probability be interpreted one way by a Democratic Congress and another way by a Republican Congress and the situation would be no improvement on what has been our past experience. It would seem that if the commission can be so constituted as to make a thorough and impartial investigation of the various phases of the tariff, it would be eminently proper for that body to make recommendations based on such investigation.

Germany's Lead in Electric Steel

The ability of the electric furnace to meet unusual conditions efficiently is demonstrated by Germany's electric steel output last year. Under war conditions, 129,646 metric tons of electric steel was produced in such furnaces in 1915—the largest output in Germany's history and probably exceeding that of any other country. This was done despite the fact that the total steel production last year was 30 per cent below normal.

The explanation is found in the electric furnace's adaptability to make shell steel and tool steel. Without doubt large quantities of borings and turnings from shell manufacture have been accumulating in Germany. Their speedy conversion into munition steel at a low cost has probably been accomplished on a large scale. The electric furnace can handle such scrap with great efficiency and without much loss or the need of more costly materials in the mixture.

The acute demand for high-speed steel to machine shells and shrapnel has probably been largely met in Germany by this new melting medium, for the crucible steel output in 1915 was only slightly in excess of that for former years. Again the advantage of the electric furnace is demonstrated in that large quantities of alloy steel can be melted and purified with little loss of valuable elements and in a relatively short time. In the United States heats of such steel as large as six tons are being successfully made electrically. At the present price of high-speed steel, about \$3 per pound, such a heat represents about \$36,000 in the furnace. To make an equal amount in crucibles, with as little loss and in as short a time, is not to be expected.

Present indications are that the steel output of electric furnaces in this country will soon exceed the remarkable showing of Germany, for the United States now leads all countries in the number of such furnaces operating and is fast increasing this lead as well as the variety of products made from electrically refined steel.

CORRESPONDENCE

Getting Rid of the Odds and Ends

To the Editor: It would appear that to-day is the opportunity of a lifetime to sell all the odds and ends that may have accumulated around the factory. Not only will it prove a profitable transaction, but some other manufacturer may be in real need of just that very article which is taking up valuable storage space in your stockroom. Furthermore, you will receive real money for many articles which, as far as you are concerned, are dead stock. And what interests particularly is the fact that you will receive not only the return of the original investment but a good rate of interest besides.

Have the foremen of the different departments report all the odd items that have accumulated, from time to time. In the smithshop there will undoubtedly be certain sizes of bar steel, which were ordered for special jobs, and, when the shipment was received, a few extra bars came in. These may be of a special grade and not suitable for your regular lines of manufacture. Or the size may be such that it would not be a paying proposition to use it elsewhere. In the machine shop there will probably be certain sizes or shapes of cold-rolled steel, which were also ordered for special work, but through some change in design, the material was not used. Steel I-beams, channels, angles, tees, zeos, whether of standard size or special shape, should be disposed of at this time, providing that your own requirements may not need them in the near future.

DEAD STOREROOM STOCK

When we come to the stockrooms, it is hardly possible that we will find nothing but standard goods, such as those used in the output of the plant. How often has an article been returned to the stockroom because it seemed to be the easiest way to dispose of it, as far as the foreman was concerned. The stockroom keeper has possibly tried to have it used but it never seemed to be just what was wanted. Maybe it is only one valve, or a whistle or a lubricator. Or a part-of-a-roll of leather belting, which was formerly used but owing to a change in equipment, no longer seems to fit in anywhere. Probably there are certain sizes of bolts, set screws, wood screws, studs or rivets, which are taking up valuable space and yet are no longer required.

Have some competent person spend a few hours investigating the odds and ends. It will not only result

in a cleaner stock but prove remunerative. Make up lists of what you have to offer and send copies to the firms that handle each of the various lines. Fix the prices within reason and the dead stock will disappear. Probably in your own town there are jobbers who will be glad to buy up the small lots. At least you can give them a copy of the list and give them the opportunity of selling the different items, subject, of course, to prior sale. In towns where there are manufacturers' associations organized, the lists could be sent to the secretary of the association and the different members could telephone, when in need of small lots of any of the items.

At the present time there is a serious shortage of paper-making materials. In every office there are a number of magazines and trade papers received weekly. Some of these are filed away for future reference but a certain percentage are placed on a pile and when the pile gets to a certain size, it is gotten rid of, either by burning or by sale. It is wasteful to burn these papers. They are just as good for making over again into plain paper as they ever were. If one does not want to bother with selling them, then he may give them away but at least not destroy them.

The scrap from high-speed steel today is worth more than the new bars were some months ago. It will pay to forge the short pieces, from lathe or planer tools, into tool bits. Short pieces of high-speed steel can be welded or brazed to carbon steel successfully. Care must be exercised to prevent overheating the high-speed steel.

MAKING USE OF OFF SIZE MATERIAL

It will probably be found that there are certain items in the factory that, ordinarily, the excessive amount of waste would not permit of their being used in place of other items but now, under present market prices, it is cheaper to use them than to purchase a new supply of the proper size. For instance, there might be a large stock of 3/16-in. tank steel on hand, and for the job in process 1/8-in. material would be ample; but owing to a surplus stock of the 3/16-in. material, purchased before the high advances went into effect, it would be considerably cheaper to use the tank steel of the heavier weight.

Usually small size bolts can be purchased cheaper than they can be made by the factory using them, but under existing conditions the matter is open to argument. If bars are being secured on old contracts, probably under 1.50c base, and the contract for bolts has expired or will expire shortly, there is no doubt that the bolts can be made cheaper than they can be bought, providing, of course, that suitable equipment is at hand to head the bolts and thread them. Ordinary carriage and machine bolts are quoted today at prices, which are considerably over 100 per cent greater than the prices in force some months ago. H. A. RUSSELL.

Some Canadian Precepts for American Consumption

To the Editor: Firms in the United States doing business with or attempting to secure business from Canada should keep the following in mind:

When sending postcard or envelope for reply, *don't* use United States stamps.

Don't forget that there is 1c. additional postage required on every card or letter mailed in Canada.

Don't send or expect to receive day letters by telegraph; these are confined to United States.

Don't overlook, in making shipments into Canada, the fact that an export manifest is required by United States Customs. A certified invoice in duplicate is required by Canadian Customs. This invoice must show market price for home consumption at the time and place of shipment, as well as the price governing sale to the customer in Canada.

Don't do any advertising in Canadian publications having any special significance in connection with Decoration Day, Fourth of July or Thanksgiving Day.

Don't overlook the fact that the average Canadian business man is as well posted regarding United States

geography, history and news as those living in the United States, while the reverse is far from true.

There is nothing difficult about customs regulations provided some one in your office familiarizes himself thoroughly with them and gives the matter attention. Every Canadian business man is well posted as to customs regulations. Very few United States firms are.

We trust the foregoing will be of some benefit to all concerned.

DOMINION SHEET METAL COMPANY, LTD.,
A. T. Enlow, President.
Hamilton, Canada, March 27, 1916.

Natural Gas Shortage at Pittsburgh

Last week the Chamber of Commerce of Pittsburgh took up with representatives of three or four of the leading natural gas companies the question of the increase in rates for natural gas supplied to manufacturing consumers, and also the question of future supply. Three or four hearings were held and testimony as to the shortage in supply of gas during the recent cold weather was given by a number of Pittsburgh manufacturers, and representatives of the gas companies were heard as to the probable supply of gas in the future for manufacturing purposes. It was brought out that to the unprecedented demand for gas during the winter because of the great activity in business and to the very heavy consumption by domestic users was due the shortage in supply. It was stated that in the past five years very few fertile gas fields have been found, and the gas companies have been compelled to pipe gas for hundreds of miles at a great cost. On one day in August last the average domestic consumer used 127 cu. ft. per day, while on a cold winter day the average jumped to over 1000 cu. ft. The gas companies have appointed a committee to prepare figures showing the consumption of gas, the amount delivered by the different gas fields and other data. In the meantime the advance of 15 per cent to manufacturing consumers of natural gas went into effect April 1. Representatives of the gas companies have indicated that with the great increase in domestic use of natural gas, in five or six years the companies will be unable to furnish any gas for manufacturing purposes, unless new gas fields are discovered in the meantime, which is thought unlikely. At present domestic consumers in the Pittsburgh district are paying 30c. net per 1000 cu. ft., while some very large manufacturing consumers have been getting gas as low as 10c. and 12c. per 100 cu. ft.

The shortage of natural gas during the cold weather in March proved costly to a number of steel manufacturers. One open-hearth steel company claims that its natural gas was turned off without warning, with the result that the heats in five of its open-hearth furnaces were lost, and that this cost the company thousands of dollars. Another large concern in Pittsburgh making nuts and bolts was unable to get enough gas during the day to operate, and tried the experiment of running at night when the supply is better, owing to many domestic consumers shutting off gas at night. The experiment was not very successful, the company stating that the output at night was much less than in the day, and in addition it had to pay its men time and half time and in some cases double time for working at night.

The expansion of the business and professional service of the Dorr Cyanide Machinery Company, due to the increasing use of Dorr machinery in so many varied processes, has necessitated an enlargement of its engineering staff and facilities and made advisable the incorporation of the Dorr Company. The new company takes over the patents and commercial business of its predecessor, and will act in a consulting capacity in connection with the design, construction and operation of hydrometallurgical, wet chemical and allied industrial plants and the conduct of technical investigations. The headquarters are at Denver, Col., with branch offices at 17 Battery Place, New York, and 16 South Street, London, E. C., England. John V. N. Dorr is president.

BETHLEHEM'S TIN-PLATE PLANT

To Triple the Size of the Baltimore Sheet & Tin Plate Plant Which It Has Acquired

The Bethlehem Steel Company has purchased the property and contracts of the Baltimore Sheet & Tin Plate Company, which was to be built on the outskirts of Canton, Md., between the city of Baltimore and Sparrows Point, Md., the site of the works of the Maryland Steel Company now a part of the Bethlehem Steel Company. Instead, however, of continuing the development of the tin-plate plant at Canton, the Bethlehem Company is to erect its tin-plate works at Sparrows Point and it is to carry on the project on three times the scale under which the Baltimore Sheet & Tin Plate Company was planned. The Canton plant comprehended 12 hot and 12 cold mills to produce 1,000,000 base boxes of tin plate per year, while the Bethlehem program, it is understood, will include the manufacture of black and blue annealed sheets as well as the tin plate. It will be recalled that in connection with the Bethlehem purchase of the plant of the Maryland Steel Company, it was explained that a sheet and tin-plate plant would be added and this plan has been pushed that much more ahead by taking over the contracts made by the Baltimore Sheet & Tin Plate Company.

J. M. Jones, president of the Baltimore Sheet & Tin Plate Company, and until March 1 vice-president and general manager of the Massillon Rolling Mill Company, Massillon, Ohio, is to continue in charge of the tin-plate plant developments under the Bethlehem Steel Company. The Baltimore Company was organized with a capital stock of \$5,000,000, of which 60 per cent, or \$3,000,000, was issued, half 7 per cent cumulative preferred stock and half common stock. Subscribers are to receive par for the preferred stock, which they secured at 97, together with one-fourth of the number of shares in common stock. Under the Baltimore Company, common and preferred were to have equal voting power, with the preferred convertible into common stock at par or redeemable at 115 per cent. Dividends on the preferred stock were to begin from Oct. 2, 1916.

The plant at Sparrows Point will be in a position to compete for the heavy tin-plate consumption in Baltimore and will have a tide-water location for exports and for shipments to the Pacific coast by way of the Panama Canal.

New Steel Company Near Philadelphia

The Eddystone Steel Company, a new corporation, has taken over the plant of the former Vulcan Charcoal Iron & Steel Company at Crum Lynne, Pa., near the Eddystone plant of the Baldwin Locomotive Works. The dominant interests in the new company are connected with Walker Bros. & Haviland, 1532 Sansom Street, Philadelphia, dealers in electrical equipment. The plant is equipped with a basic open-hearth furnace of 15 to 20 tons capacity, also roughing and finishing mills and two plate mills, making plates 48 in. wide and 3/16 in. thick or under. This plant was last run experimentally to produce charcoal iron by a new process, a description of which was published in THE IRON AGE of April 18, 1912. The new company, however, will make steel billets and plates, expecting to be producing steel within two or three weeks. It is represented in New York City by W. F. Hurlburt, 50 Church Street.

Invar metal is now being made by an American steel company and strips of this nickel steel alloy are now being delivered for use by the U. S. Coast and Geodetic Survey as level rods. Bars, rods, wire and probably tubing and ingots for casting are also expected to be made successfully. The supply used to come almost exclusively from abroad.

A deposit of manganese ore in Cumberland County, near Carlisle, Pa., is about to be opened, it is reported, by Charles Wharton, Jr., of Pittsburgh. Analyses have shown about 40 to 45 per cent manganese.

The Steel Corporation and Rail Prices

E. H. Gary, chairman of the United States Steel Corporation, has issued the following statement: "The subsidiary companies of the United States Steel Corporation which manufacture rails have decided to maintain the present prices until May 1, 1916, as to rails sold for delivery up to May 1, 1917, but will make no commitments beyond that date."

McClintic-Marshall Buys Riter-Conley

The McClintic-Marshall Company, Pittsburgh, having fabricating plants at Rankin, Carnegie and Pottstown, Pa., has purchased the entire plant and business interests of the Riter-Conley Mfg. Company at Leetsdale, Pa. The plant thus acquired is about 15 miles below Pittsburgh, on the Pittsburgh, Fort Wayne & Chicago Railroad, and is said to be the largest in the world devoted to heavy plate construction work. The Riter-Conley Company has been a large builder of blast furnaces, oil tanks, gas holders and similar work. Its property at Leetsdale comprises about 65 acres of land between the railroad and the Ohio River. The main shop building is over 500 ft. wide and 600 ft. in length, having about 8 acres under one roof. The remainder of the buildings covers an area of several acres. With the acquisition of this plant, the McClintic-Marshall Company will be in position to construct complete blast furnaces, steel plants and gas works, build oil tanks and do similar work. The new owner will operate the Riter-Conley plant independently under its present name. The combined capacity of the plants of the McClintic-Marshall Company is now 275,000 tons of finished structural steel and plate work per year. J. Gilmore Fletcher, president of the Riter-Conley Mfg. Company, since the death of Thomas B. Riter, will retire to look after his other interests. A complete description of the plant of the Riter-Conley Mfg. Company appeared in THE IRON AGE of May 14, 1914.

Lack of Boats Forces Concessions on Ore

The unprecedented inadequacy of vessel tonnage for the coming ore season is working a variety of hardships. Some of the ore interests that lack vessel capacity of their own will find themselves brought almost to a standstill in the movement of their ore. Certain Cuyuna range operations have promised profitable returns under this year's advance in prices, even though some of this ore is understood to have been offered early in the year at a slight concession from the full schedule. Recently, however, it is reported that offerings of such ore have been made on the basis of last year's quotations at the mines for the reason that the owners have been unsuccessful in their efforts to secure boats.

Railroad Conventions at Atlantic City

The annual convention of the Master Car Builders' Association will be held at Atlantic City, N. J., commencing June 14. The American Railway Master Mechanics' Association will meet the following week, the opening session to be held June 19. The annual exhibit of the Railway Supply Manufacturers' Association, which is held in connection with these conventions, will be open from June 12 to 22.

Announcement is made that the control of the Morris Iron & Steel Corporation, which has a well equipped plant at Frederick, Md., has passed to W. H. Schott, Chicago, Ill. The deal is expected to go through in the early part of June, and it is stated that plans then will be made for enlarging the plant to such an extent that it will employ at least 1000 workers in the various departments. It will be known as the Maryland Iron & Steel Company.

The Bessemer department of the Bethlehem Steel Company's Lehigh plant at South Bethlehem, Pa., has resumed operations. It was shut down June 30, 1913.

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NEW PIG-IRON RECORD

March Output 107,667 Tons a Day

A Net Gain of Five Furnaces—Good Increase in Manganese

Adverse weather conditions in March and troubles here and there with coke shipments did not prevent another gain in pig-iron output, the total for the month reaching the astonishing figure of 3,337,691 tons, or 107,667 tons a day, as against 3,087,212 tons in February, or 106,456 tons a day. The number of active furnaces showed a gain of five in the month, or from 312 on March 1 to 317 on April 1. Output of merchant pig iron has doubled in 13 months, reaching 31,393 tons a day in March, against 15,621 tons in February of last year. Total active capacity on April 1 was 108,509 tons a day, against 107,310 tons a day on March 1. Estimating charcoal pig iron at 365,000 tons a year, production is now at the rate of 39,971,000 tons, or practically the 40,000,000-ton goal which has been in sight for some time.

Production of ferromanganese and spiegeleisen increased sharply last month to 29,388 tons, against 23,877 tons in February, and an average for the last six months of 1915 of 24,370 tons.

DAILY RATE OF PRODUCTION

The daily rate of production of coke and anthracite pig iron by months, from March, 1915, is as follows:

Daily Rate of Pig-Iron Production by Months—Gross Tons			
	Steel works	Merchant	Total
March, 1915	50,036	16,539	66,575
April	52,804	17,746	70,550
May	54,655	18,360	73,015
June	59,022	20,339	79,361
July	62,895	19,796	82,691
August	67,801	21,865	89,666
September	70,977	24,108	95,085
October	73,595	27,227	100,822
November	73,282	27,962	101,244
December	73,647	29,686	103,333
January, 1916	72,614	30,182	102,746
February	75,305	31,151	106,456
March	76,274	31,393	107,667

OUTPUT BY DISTRICTS

The accompanying table gives the production of all coke and anthracite furnaces in March and the three months preceding:

Monthly Pig-Iron Production—Gross Tons				
	Dec. (31 days)	Jan. (31 days)	Feb. (29 days)	Mar. (31 days)
New York	193,818	196,448	191,648	205,034
New Jersey	5,169	4,471	0	0
Lehigh Valley	108,862	111,744	104,207	109,598
Schuylkill Valley	92,391	89,151	90,507	94,264
Lower Susquehanna and Lebanon Valley	60,785	66,651	61,362	63,142
Pittsburgh district	750,186	763,127	717,928	793,916
Shenango Valley	190,807	184,031	185,161	183,432
Western Pennsylvania, Maryland, Virginia and Kentucky	177,002	175,717	170,597	175,738
Wheeling district	86,448	89,513	85,056	93,376
Mahoning Valley	117,202	113,989	110,105	120,222
Central and Northern Ohio	320,196	271,306	310,742	334,527
Hocking Valley and Hanging Rock	254,542	263,090	240,271	247,833
Chicago district	39,310	50,774	45,850	53,237
Mich., Minn., Mo., Wis. and Col.	459,524	455,545	428,257	479,659
Alabama	97,087	97,120	95,806	112,099
Tennessee	228,697	229,584	226,688	235,483
Tennessee	21,296	22,860	23,027	25,137
Total	3,203,322	3,185,121	3,087,212	3,337,691

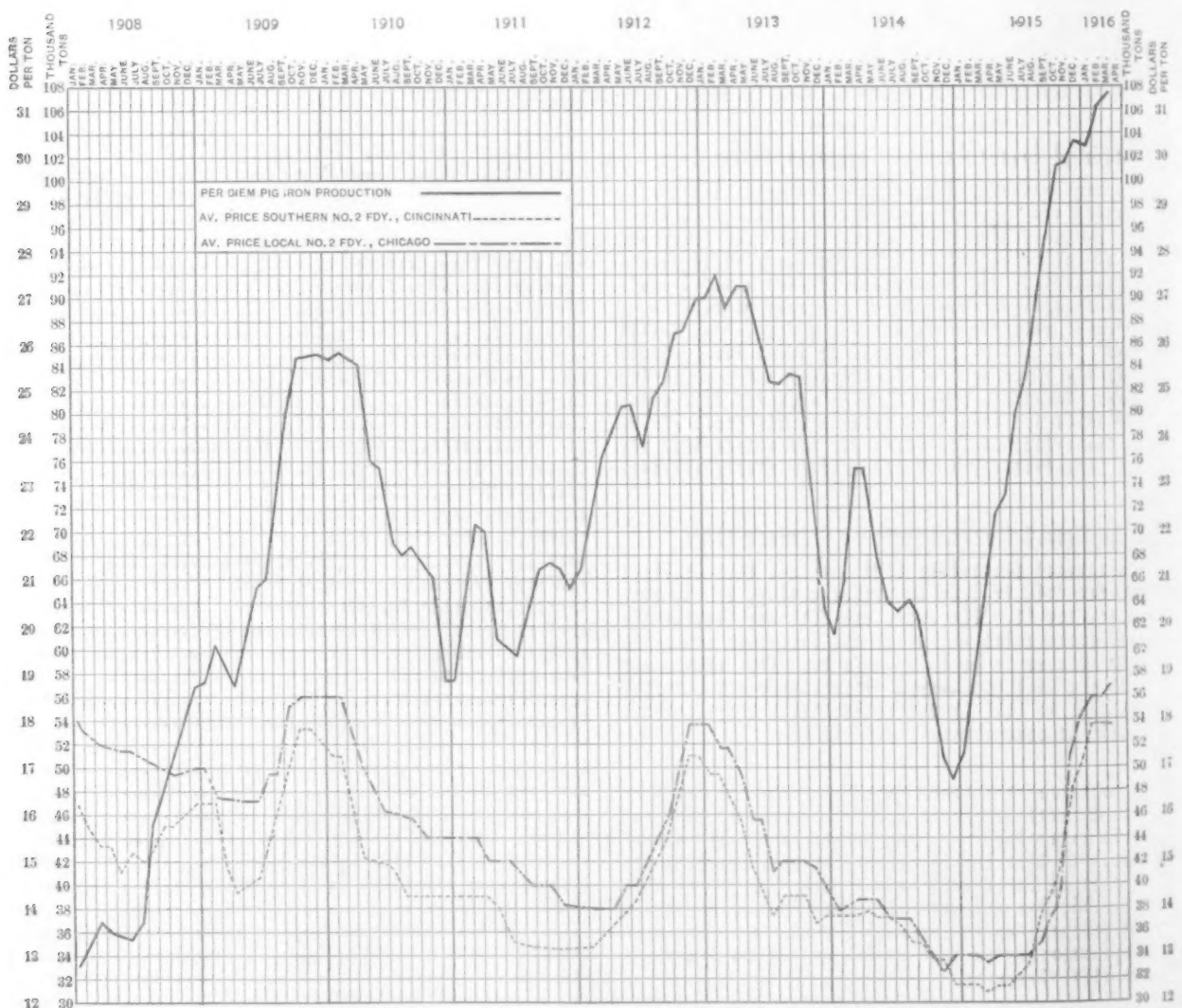


Diagram of Daily Average Production by Months of Coke and Anthracite Pig Iron in the United States from Jan. 1, 1908, to April 1, 1916; Also of Monthly Average Prices of Southern No. 2 Foundry Iron at Cincinnati and Local No. 2 Foundry iron at Chicago District Furnace

PRODUCTION OF STEEL COMPANIES

Returns from all furnaces of the United States Steel Corporation and the various independent steel companies show the following totals of product month by month. Only steel-making iron is included in the figures below, together with ferromanganese and spiegeleisen. These last, while stated separately, are also included in the columns of "total production."

	Pig, total production—			Spiegeleisen and ferromanganese		
	1914	1915	1916	1914	1915	1916
Jan.	1,261,430	1,115,944	2,251,035	17,325	18,041	24,866
Feb.	1,329,414	1,237,380	2,183,845	10,524	13,319	23,877
Mar.	1,704,688	1,551,082	2,365,116	20,133	12,274	29,388
Apr.	1,635,226	1,584,111	.....	18,676	12,337	.....
May	1,457,847	1,694,290	.....	21,504	13,440	.....
June	1,329,623	1,770,657	.....	16,254	19,200	.....
July	1,395,851	1,949,750	.....	16,524	17,854	.....
Aug.	1,455,054	2,101,818	.....	11,577	27,463	.....
Sept.	1,390,322	2,129,322	.....	13,786	23,159	.....
Oct.	1,271,820	2,281,456	.....	17,435	23,992	.....
Nov.	1,059,159	2,198,459	.....	21,977	28,741	.....
Dec.	1,034,802	2,283,047	.....	20,733	25,004	.....

CAPACITY IN BLAST APRIL 1 AND MARCH 1

The following table shows the daily capacity in gross tons of furnaces in blast April 1 and March 1 by districts:

Location of furnaces	Coke and Anthracite Furnaces in Blast			Total		
	Number of stacks	Number in blast	Capacity per day	Number in blast	Capacity per day	Capacity per day
New York:						
Buffalo	19	17	6,017	17	6,018	
Other New York	5	3	597	3	589	
New Jersey	6	0	0	0	0	
Pennsylvania:						
Lehigh Valley	20	14	3,413	14	3,440	
Spiegel	2	2	222	2	218	
Schuylkill Val.	12	10	3,041	11	3,265	
Lower Susquehanna	6	5	1,228	5	1,318	
Lebanon Valley	9	6	937	6	797	
Pittsburgh Dist.	53	52	25,267	52	24,721	
Ferro	3	3	343	3	350	
Shenango Val.	19	19	6,240	19	6,420	
Western Pa.	22	17	5,654	17	5,714	
Ferro	4	3	165	3	168	
Maryland	3	3	1,250	4	1,380	
Ferro	1	1	98	0	0	
Wheeling Dist.	14	12	4,440	10	3,796	
Ohio:						
Mahoning Val.	25	24	10,394	25	10,885	
Central and Northern	23	21	7,995	21	8,285	
Hock. Val. and Hang'g Rk.	15	11	1,717	11	1,629	
Ill. and Ind.	35	32	15,733	31	14,836	
Ferro	1	1	40	1	86	
Michigan, Wis. & Minn.	12	9	2,525	9	2,464	
Col. and Mo.	6	3	1,044	3	1,039	
Ferro	1	1	86	0	0	
The South:						
Virginia	18	9	1,186	9	1,182	
Kentucky	5	4	470	3	495	
Alabama	38	27	7,596	26	7,420	
Tennessee	15	8	811	8	795	
Total	392	317	108,509	312	107,310	

Among furnaces blown in in March were one Colebrook in the Lebanon Valley, Watts in Kentucky, one Mingo (new) and one Steubenville in the Wheeling district, one Gary in the Chicago district and one Pueblo in Colorado.

The furnaces blown out last month were Keystone in the Schuylkill Valley and Anna in the Mahoning Valley.

THE RECORD OF PRODUCTION

	Production of Coke and Anthracite Pig Iron in the United States by Months Since Jan. 1, 1912—Gross Tons				
	1912	1913	1914	1915	1916
Jan.	2,057,911	2,795,331	1,885,054	1,601,421	3,185,121
Feb.	2,100,815	2,586,337	1,888,670	1,674,771	3,087,212
Mar.	2,405,318	2,763,563	2,347,867	2,063,834	3,337,691
3 mo.	6,564,044	8,145,231	6,121,591	5,340,026	9,610,024
Apr.	2,375,436	2,752,761	2,269,655	2,116,494	.....
May	2,512,582	2,822,217	2,092,686	2,263,470	.....
June	2,440,745	2,628,565	1,917,783	2,380,827	.....
July	2,410,889	2,560,646	1,957,645	2,563,420	.....
Aug.	2,512,431	2,545,763	1,995,261	2,779,647	.....
Sept.	2,463,829	2,505,927	1,882,577	2,852,561	.....
Oct.	2,689,933	2,546,261	1,778,186	3,125,491	.....
Nov.	2,630,854	2,233,123	1,518,316	3,037,308	.....
Dec.	2,782,737	1,983,607	1,515,752	3,203,322	.....
Total	29,383,490	30,724,101	23,049,752	29,662,566	.....

DIAGRAM OF PIG-IRON PRODUCTION AND PRICES

The fluctuations in pig-iron production from January, 1908, to the present time are shown in the accompanying chart. The figures represented by the heavy

lines are those of daily average production, by months, of coke and anthracite iron. The two other curves on the chart represent monthly average prices of Southern No. 2 foundry pig iron at Cincinnati and of local No. 2 foundry iron at furnace at Chicago. They are based on the weekly market quotations of THE IRON AGE. The figures for daily average production, beginning January, 1909, are as follows:

Daily Average Production of Coke and Anthracite Pig Iron in the United States by Months Since Jan. 1, 1909—Gross Tons

	1909	1910	1911	1912	1913	1914	1915	1916
Jan.	57,975	84,148	56,752	66,384	90,172	60,808	51,659	102,746
Feb.	60,976	85,616	64,090	72,442	92,369	67,453	59,813	106,456
Mar.	59,232	84,459	70,036	77,591	89,147	75,738	66,575	107,667
Apr.	57,962	82,792	68,836	79,181	91,759	75,665	70,550	.....
May	60,753	77,102	61,079	81,051	91,039	67,506	73,015	.....
June	64,656	75,516	59,585	81,358	87,619	63,916	79,361	.....
July	67,793	69,305	57,841	77,738	82,601	63,150	82,691	.....
Aug.	72,546	67,963	62,150	81,046	82,057	64,363	89,666	.....
Sept.	79,507	68,476	65,903	82,128	83,531	62,753	95,085	.....
Oct.	83,856	67,520	67,811	86,722	82,133	57,361	100,822	.....
Nov.	84,917	63,659	66,648	87,697	74,453	50,611	101,244	.....
Dec.	85,022	57,349	65,912	89,766	63,987	48,896	103,333	.....

Blast Furnace Notes

The new No. 1 furnace of the Carnegie Steel Company at Mingo Junction, Ohio, was blown in March 29. The work of construction has been under way since the spring of 1915.

The Noble Electric Steel Company will resume operations April 10 at its electric furnaces at Heroult, Cal., which for most of last year were producing pig iron and ferromanganese.

Detroit Furnace Company, Detroit, Mich., is making repairs on its Wayne furnace with a view to blowing it in.

The Oxford, N. J., furnace of the Empire Steel & Iron Company, which has been undergoing relining in the past ten weeks, will be blown in this month.

The Virginia Iron, Coal & Coke Company, with its No. 2 stack at Middlesboro, Ky., in operation, is making repairs to stack No. 1 and will blow it in.

The Struthers Furnace Company, Struthers, Ohio, blew out its furnace March 29, for relining and other repairs, including the installation of a gas washer and the erection of a standpipe. These repairs will keep the furnace out of blast until about June 15.

On April 1 the Carnegie Steel Company had 56 of its 59 furnaces in blast and only three idle. The latter were one Edgar Thomson and one Bellaire, both of which are being relined and repaired, and the small isolated Zanesville stack at Zanesville, Ohio. The company now has four Mingo furnaces at Mingo Junction, Ohio, the new stack, No. 1, having been completed and blown in March 29. Steubenville furnace at Steubenville, Ohio, was started March 18.

Whitaker-Glessner Will Build Blast Furnace

The Whitaker-Glessner Company, Wheeling, W. Va., which is about to issue \$3,000,000 in bonds, has decided to build a blast furnace at its Portsmouth works, Portsmouth, Ohio, to have a capacity of 500 tons per day or more. The pig iron from this stack will be used in the company's open-hearth steel plant at Portsmouth, which contains seven open-hearth furnaces, three or four of which are of 60 tons capacity per heat each and the others are of smaller size. It is also likely that a battery of 70 or 80 by-product coke ovens will be built at Portsmouth to supply coke to the new furnace. Splendid coal for coking purposes is abundant in the vicinity of Portsmouth, and could be mined and delivered to the ovens at low cost. The company has recently made a long-time contract for its entire supply of sheet bars for its sheet mills at Wheeling and Martins Ferry.

Announcement is made by E. E. Bissett, manager of the furnace plant of the Charcoal Iron Company of America at Ashland, Wis., that a voluntary advance of 11 per cent in the wages of all employees will be made effective April 11.

Iron and Steel Markets

PIG-IRON RATE 40 MILLIONS

An Advance in Rail Prices Foreshadowed

Foreign Inquiry Still Large—March Records at Steel Works, but Pressure Keeps Up

March brought the production of American iron and steel to new and astonishing figures, so that the rate for pig iron is now practically 40,000,000 tons, and for steel ingots 43,000,000 to 44,000,000 tons. At the same time mills made no headway in March in overtaking orders; some of them fell farther behind.

Significant in its bearings, both upon rail prices and expectations of the duration of large consumption of steel, is an announcement just made by the United States Steel Corporation that its rail-making subsidiaries "have decided to maintain the present prices until May 1, 1916, as to rails sold for delivery up to May 1, 1917, but will make no commitments beyond that date."

The statement is taken as the forerunner of advances in rail prices, which for some time have been justified on the score of wage advances, the high price of ferromanganese, and the much higher prices paid for other forms of steel with which the mills are crowded. It may safely be added that this notification means a large influx of rail orders in the present month, though how much space is still available at rail mills for rollings in the first four months of 1917 is a question. On some of the rails ordered last month deliveries run up to July 1, 1917.

There has been a growing sentiment that more stringent rail specifications would in time bring higher prices, and independent rail manufacturers are not likely to be behindhand in putting rails in closer relationship to the general steel market. It is now nearly a year since the railroads were advised of the danger of overstaying their market.

Some good-sized additions have been made to the heavy March rail orders already reported. The Santa Fe has reserved about 60,000 tons with the Colorado mill after placing 12,000 tons at Chicago. The Seaboard Air Line has bought 25,000 tons; the Buffalo, Rochester & Pittsburgh, 12,000 tons; the Atlantic Coast Line, 10,000 tons; the Wabash, 15,000 tons; Delaware, Lackawanna & Western, 15,000 tons; Boston & Maine, 15,000 tons; Erie, 30,000 tons. Probably 300,000 tons is under inquiry, including the Pennsylvania Railroad's quota. Considering their under-buying of recent years, the railroads have been entirely conservative in their late contracts. Efforts to increase orders thus far given would be no surprise, after the Steel Corporation's notice.

Pig-iron production in March was 3,337,691 tons, or 107,667 tons a day, against 3,087,212 tons in February, or 106,456 tons a day. Active capacity

April 1 was 108,509 tons a day for 317 furnaces, as compared with 107,310 tons a day for 312 furnaces one month previous. Thus April opened with production at the rate of 39,606,000 tons a year for coke iron. Estimating charcoal iron at 1000 tons a day, brings the yearly rate within 30,000 of 40,000,000 tons.

It was said in some quarters three months ago that furnaces compelled to go out for relining would thereafter nearly balance those going in. But meanwhile the active list has grown from 295 to 317—a gain of 22.

Pig-iron buying has been less, as was indicated a fortnight ago. Prices have been stronger in some districts; but at Pittsburgh those for steel-making iron are at a standstill, and Southern iron has been offered at lower prices in the Chicago district. Alabama pig iron stocks increased about 20,000 tons in March after an increase of 25,000 tons in February.

Other features of the market are further inquiries for steel for export including 80,000 tons, chiefly billets and blooms, from one New York buyer; lower coke and scrap prices; an advance of \$5 on light rails, of \$2 to \$3 on light gages of black sheets and of \$3 a ton on spikes. In semi-finished steel the available supply at Pittsburgh has increased fractionally.

London cables tell of a deadlock on rails in the British market, as makers have other uses for their steel. Among orders supposed to have gone to the United States are 12,000 tons for Egypt and 10,000 tons for Australia. Russia has bought 8000 tons of light rails at Chicago and has yet to place portions of the 300,000 tons her agents set out to get from the United States. Some large lots of shell bars and one of 30,000 tons of barb wire for the Allies are before the market here, but mills are so far sold up negotiations are slow.

Pittsburgh

PITTSBURGH, PA., April 4, 1916.

Steel mills report the demand as insistent as ever. In spite of the fact that the output of semi-finished and finished steel by nearly all the mills in March made new high records, deliveries are as far back as ever. As stated last week, new buying is not so heavy as it was some time ago. The past week prices on light gage black sheets and galvanized sheets were advanced \$2 to \$3 per ton, spikes \$3 and light rails \$5. Coke and scrap are off and likely to be still lower. The pig-iron market is quiet, and the supply of Bessemer and open-hearth semi-finished steel seems to be slightly better. It is claimed that, even should peace negotiations start, the amount of business now on the books of the mills would carry them over practically the remainder of this year, and for this reason they expect that present high prices are likely to be maintained this year at least. The railroad embargoes are still on, and have seriously interfered with export shipments. Domestic consumers are getting deliveries on material that otherwise would be exported.

Pig Iron.—W. P. Snyder & Co. report the average price of Bessemer iron in March, based on sales of 1000 tons or over, to have been \$20.8625, an increase over

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous

	April 5, 1916.	Mar. 29, 1916.	Mar. 1, 1916.	April 7, 1915.
Pig Iron, Per Gross Ton:				
No. 2, Philadelphia...	\$20.50	\$20.25	\$20.00	\$14.25
No. 2, Valley furnace...	18.50	18.50	18.50	12.75
No. 2, Southern, Cin'ti...	17.90	17.90	17.90	12.15
No. 2, Birmingham, Ala...	15.00	15.00	15.00	9.25
No. 2, furnace, Chicago*	19.00	19.00	18.50	13.00
Basic, del'd, eastern Pa...	21.00	20.00	19.50	13.50
Basic, Valley furnace...	18.25	18.25	18.00	12.50
Bessemer, Pittsburgh...	21.95	21.95	21.45	14.55
Malleable Bess., Ch'go*	19.50	19.50	19.00	13.00
Gray forge, Pittsburgh...	18.70	18.45	18.45	13.45
1. S. charcoal, Chicago...	19.75	19.75	19.75	15.75

Billets, etc. Per Gross Ton:				
Bess. billets, Pittsburgh...	45.00	45.00	37.00	20.00
O.-h. billets, Pittsburgh...	45.00	45.00	38.00	20.00
O.-h. sheet bars, P'gh...	45.00	45.00	38.00	21.00
Forging billets, base, P'gh	67.50	65.00	55.00	25.00
O.-h. billets, Phila...	50.00	50.00	42.00	21.52
Wire rods, Pittsburgh...	60.00	57.00	50.00	25.00

Finished Iron and Steel,

Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Bess. rails, heavy, at mill	1.25	1.25	1.25	1.25
Iron bars, Philadelphia...	2.559	2.559	2.559	1.15
Iron bars, Pittsburgh...	2.50	2.40	2.35	1.20
Iron bars, Chicago...	2.35	2.35	2.00	1.15
Steel bars, Pittsburgh...	2.75	2.75	2.50	1.20
Steel bars, New York...	2.919	2.919	2.669	1.319
Tank plates, Pittsburgh...	3.50	3.50	2.75	1.15
Tank plates, New York...	3.669	3.669	3.169	1.269
Beams, etc., Pittsburgh...	2.50	2.50	2.25	1.20
Beams, etc., New York...	2.669	2.669	2.419	1.269
Skelp, grooved steel, P'gh	2.35	2.35	2.10	1.12½
Skelp, sheared steel, P'gh	2.45	2.45	2.20	1.17½
Steel hoops, Pittsburgh...	3.00	3.00	2.50	1.25

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

	April 5, 1916.	Mar. 29, 1916.	Mar. 1, 1916.	April 7, 1915.
Sheets, Nails and Wire,				
Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, P'gh	2.85	2.75	2.60	1.80
Galv. sheets, No. 28, P'gh	5.00	4.75	4.75	3.30
Wire nails, Pittsburgh...	2.40	2.40	2.40	1.60
Cut nails, Pittsburgh...	2.30	2.30	2.30	1.55
Fence wire, base, P'gh...	2.25	2.25	2.25	1.40
Barb wire, galv., P'gh...	3.25	3.25	3.25	2.10

Old Material, Per Gross Ton:

Iron rails, Chicago...	18.00	18.00	17.25	12.00
Iron rails, Philadelphia...	20.00	20.00	19.50	13.00
Carwheels, Chicago...	14.00	14.50	13.50	9.75
Carwheels, Philadelphia...	17.50	17.50	16.50	11.00
Heavy steel scrap, P'gh...	18.25	18.50	17.75	12.00
Heavy steel scrap, Phila...	18.00	17.50	16.50	11.00
Heavy steel scrap, Ch'go	16.50	16.75	15.75	9.00
No. 1 cast, Pittsburgh...	16.25	16.25	15.75	12.00
No. 1 cast, Philadelphia...	18.00	17.00	17.00	12.00
No. 1 cast, Ch'go (net ton)	13.00	13.50	13.25	9.00

Coke, Connellsville, Per Net Ton at Oven:

Furnace coke, prompt...	\$2.75	\$3.25	\$3.50	\$1.50
Furnace coke, future...	2.90	3.00	2.50	1.65
Foundry coke, prompt...	3.75	3.75	3.75	2.00
Foundry coke, future...	3.50	3.50	3.50	2.15

Metals,

Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York...	27.50	27.12½	27.37½	17.25
Electrolytic copper, N. Y.	27.37½	26.87½	27.12½	15.87½
Spelter, St. Louis...	17.50	17.50	20.50	9.37½
Spelter, New York...	17.75	17.75	20.75	9.62½
Lead, St. Louis...	8.00	8.00	6.30	4.12½
Lead, New York...	8.00	8.00	6.30	4.20
Tin, New York...	50.62½	50.00	48.00	47.25
Antimony, Asiatic, N. Y.	45.00	45.00	44.00	21.00
Tin plate, 100-lb. box, P'gh	\$4.50	\$4.25	\$4.00	\$3.25

February of about 65c., and on basic for March, \$18.25, an increase over February of 26.6c., all at Valley furnace. The local pig-iron market is quiet, but prices are fairly strong. A local dealer has sold 6000 tons of basic for delivery to a new foundry near Economy, Pa., taking coke in exchange, the buyer of the iron having a coke works in the Connellsville region. An inquiry is in the market from an Eastern consumer for 10,000 tons of basic. We note a sale of 600 tons of Bessemer, 150 tons a month starting April, at the average price per month. Foundry iron is quiet. The supply of Bessemer iron is limited. Some sellers are holding it at \$21.50, Valley furnace. We quote Bessemer iron at \$21 to \$21.50; basic, \$18.25; gray forge, \$17.75 to \$18; malleable Bessemer, \$18.50 to \$19, and No. 2 foundry, \$18.50 to \$19, all at Valley furnace, the freight rate from furnace for delivery in the Pittsburgh or Cleveland district being 95c. per ton.

Billets and Sheet Bars.—The March output and shipments of billets and sheet bars at practically all steel plants broke all records, and yet there is much complaint from consumers over unsatisfactory deliveries by the mills. At the same time it is true that semi-finished steel is being offered by several dealers who heretofore have not been able to supply it at any price. It is said that one or two sales of open-hearth billets for delivery in six to eight weeks have recently been made at less than \$45 at mill. We note a sale of 400 tons of forging billets, not exceeding 0.25 carbon, for delivery at convenience of the mill, which would be in four to six months, at \$67.50, f.o.b. Pittsburgh. For delivery over the second quarter, and possibly into third quarter, we quote: Bessemer billets, \$45; open-hearth billets, \$45; Bessemer sheet bars, \$45, and open-hearth sheet bars, \$45, maker's mill, Pittsburgh or Youngstown districts. We quote forging billets at \$67.50 for sizes up to but not including 10 x 10 in., and for carbons up to 0.25, the regular extras being charged for larger sizes and higher carbons. Forging billets running above 0.25 and up to 0.60 carbon take \$1 extra.

Steel Rails.—Effective Saturday, April 1, the makers advanced prices on light rails \$5 per ton. The demand from the coal-mining and the lumber interests has been very heavy for some time, but from the traction companies is light. The Carnegie Steel Company is receiv-

ing new orders and specifications each week for light rails ranging from 5000 to 6000 tons or more. This company has also taken recently fully 150,000 tons of standard sections for delivery in 1917. Its three rail mills at Bessemer are practically filled up for the remainder of this year on standard sections, light rails, sheet bars and steel rounds. We quote light rails as follows: 25 to 45 lb. sections, 2.10c.; 16 and 20 lb., 2.15c.; 12 and 14 lb., 2.20c., and 8 and 10 lb., 2.25c., in carloads and up to 100 tons. An advance of 5c. per 100 lb. is charged for less than carloads and down to 3 tons, while under 3 tons an additional 5c. is charged. We quote standard section rails of Bessemer stock at 1.25c. and of open-hearth steel, 1.34c., Pittsburgh.

Ferrolloys.—Uneasiness continues over the supply of ferromanganese. While two or three fairly large cargoes have lately been received at seaboard points, these have only temporarily relieved the situation. All the way from \$400 to \$450 is being offered for 80 per cent ferromanganese for prompt shipment, and sales of several cars are reported the past week at \$400, delivered. Prices on ferrosilicon are very strong, and consumers are having much trouble in getting deliveries. Nominal prices on 50 per cent ferrosilicon are \$85 up to 100 tons; over 100 tons and up to 600 tons, \$84; and over 600 tons, \$83, all per gross ton, f.o.b. Pittsburgh. Prices of Bessemer ferrosilicon for delivery over remainder of the year are as follows: 9 per cent, \$30; 10 per cent, \$31; 11 per cent, \$32; 12 per cent, \$33; 13 per cent, \$34.50; 14 per cent, \$36.50; 15 per cent, \$38.50, and 16 per cent, \$41. Seven per cent silvery for the same delivery is \$26.50; 8 per cent, \$27; 9 per cent, \$27.50; 10 per cent, \$28; 11 per cent, \$29, and 12 per cent, \$30. All these prices are f.o.b. at furnace, Jackson, Ohio; New Straitsville, Ohio, or Ashland, Ky., each of these points having a freight rate of \$2 per gross ton to Pittsburgh.

Structural Material.—Several fabricators report that new inquiry in the past week has quieted somewhat. It is evident that certain large jobs in structural steel have been put off on account of the high prices, and also because of the delays in getting deliveries from the mills. The American Bridge Company will fabricate 25,000 tons or more of structural steel for new buildings for the blast furnaces, steel works, pipe mills and ore docks

to be built by the National Tube Company in the Chicago district. It has also taken 200 tons for the National Bank of Commerce Building, Detroit, Mich., and 750 tons for transmission towers for the Duquesne Light Company, this city. The McClintic-Marshall Company has taken 700 tons for reinforcing the Second and Third Avenue elevated lines of the Interborough Rapid Transit Company, New York City, and 900 to 1000 tons of bridge work for the Pennsylvania Lines West. We quote beams and channels up to 15-in. at 2.50c. to 2.75c. at mill for delivery in third and fourth quarters of this year. For delivery from warehouse, shapes bring from 3.25c. to 3.50c. or higher.

Plates.—The Standard Oil Company placed last week two tankers with the Newport News Shipbuilding Company, each of which will take 5000 tons or more of plates and shapes, part of which will be furnished by a local mill. New orders for steel cars have been light, and the outlook is not very promising, the railroads declining in many cases to pay the high prices quoted for cars by the builders. Active inquiries in the market include 500 hopper and 250 gondolas for the Pittsburgh, Shawmut & Northern Railroad, 150 coal cars for the Youngstown Sheet & Tube Company, and 50 freight cars for the Cumberland & Pennsylvania. The Paris-Lyons Mediterranean Railway has placed 500 steel gondolas, presumably with the Standard Steel Car Company, and the Pittsburgh Railways Company has placed 25 steel street cars with the Cincinnati Car Company. Fancy prices are still being paid for plates for delivery in two to three months. We quote $\frac{1}{4}$ -in. and heavier plates for delivery at convenience of the mill, which would be in four to six months, at 2.65c. to 2.75c., and for delivery in two to three months, 3.50c. to 3.75c., maker's mill. Small lots of plates for prompt shipment have sold at 4c. to 4.50c. at mill.

Sheets.—The new demand is heavy and specifications against contracts, especially for blue annealed, electrical and sheets for deep stamping purposes, is very active. On the latter grades, mills are sold up practically for the remainder of this year, but can furnish a limited amount of light gage black and galvanized sheets for delivery in two to four months. One Youngstown mill has put its price on No. 28 black sheets at 3c., and the general market is strong at 2.85c. to 2.90c. The demand for blue annealed sheets is enormously heavy, and mills that can make fairly prompt shipments can get 3c. or more. We quote Nos. 9 and 10 blue annealed sheets at 2.90c. to 3c.; No. 28 Bessemer black, 2.85c. to 2.90c.; open-hearth, 2.95c. to 3c.; No. 28 galvanized, Bessemer stock, 4.90c. to 5c., and open-hearth, 5c. to 5.10c., most mills holding for the higher prices on both grades. We quote Nos. 22 and 24 black plate, tin mill sizes, H. R. and A., 2.70c.; Nos. 25, 26 and 27, 2.75c.; No. 28, 2.85c.; No. 29, 2.95c., and No. 30, 3c. These prices are for carload and larger lots, f.o.b. mill, Pittsburgh.

Cold Rolled Strip Steel.—Makers of cold rolled strip steel last week opened their books on contracts for delivery for the last half of the year at \$6, base, per 100 lb., and we are advised contracts have been placed at this price and for this delivery. Most makers have their output sold up through the second and third quarters, but have some material for delivery in fourth quarter. We now quote cold rolled strip steel at \$6, base, on contracts, while small lots for fairly prompt delivery bring \$6.25 and higher. The new extras adopted March 15 will be found on page 810 in THE IRON AGE of March 30.

Tin Plate.—The tin-plate mills are having trouble in getting deliveries of steel, and this is seriously holding down output. Ordinarily, tin-plate mills run 16 to 18 turns a week, but lately some have only been able to make 15 to 16 turns. Even the mills of the American Sheet & Tin Plate Company are suffering from lack of steel, and occasionally some mills are closed on Saturdays for this reason. The output of tin plate in the first quarter of 1916 was much larger than in the similar period of 1915, and has been estimated at close to 6,500,000 boxes. The output in the second quarter will probably be larger, as the McKeesport Tin Plate Company will likely have 20 new mills operating in May or early June, and the Standard Tin Plate Company will

soon have all of its 12 new mills in operation. Export inquiry is fairly heavy, but no large lots have lately been placed. On Monday, April 3, the American Sheet & Tin Plate Company advanced its price on tin plate to \$4.25 per base box, but has been selling some at \$4.50 per box. Several makers state there is no trouble in getting \$4.50 on prompt tin plate and also on contracts for deferred delivery. We quote 14 x 20 coke plates at \$4.50 per base box, and 8-lb. coated ternes at \$7.50 for 200 lb., and \$7.80 for 214 lb., all f.o.b. maker's mill, Pittsburgh.

Rivets.—Makers report orders coming in freely at present prices and another advance is looked for. The output of rivets is restricted very much by the scarcity of steel and the unsatisfactory deliveries from the mills. Several carloads of rivets are being shipped this week to India by a local maker. All makers are back in deliveries. We quote structural rivets, $\frac{1}{2}$ in. and larger, at \$3.25 per 100 lb., base, and conehead boiler rivets \$3.35, f.o.b., Pittsburgh, terms 30 days net, or one-half of 1 per cent off for cash in 10 days.

Skelp.—Local makers state they have their output sold up for practically the remainder of this year, and skelp for delivery over the next two or three months would bring premiums over regular prices. We quote grooved steel skelp at 2.35c. to 2.40c.; sheared steel skelp, 2.45c. to 2.50c.; grooved iron skelp, 2.70c. to 2.80c., and sheared iron skelp, 3c. to 3.10c., all delivered to consumers' mills in the Pittsburgh district.

Railroad Spikes.—Several makers have advanced prices \$3 per ton, and now quote \$2.65 to \$2.75 for standard railroad spikes. The new demand is not urgent and specifications from railroads are only fair. We quote:

Standard railroad spikes, $4\frac{1}{2}$ x 9/16 in. and larger, \$2.65 to \$2.75; railroad spikes, $\frac{1}{2}$ and 7/16 in., \$2.75 base; railroad spikes, $\frac{3}{4}$ in. and 5/16 in., \$3.05 base; boat spikes, \$2.80 base, all per 100 lb., f.o.b. Pittsburgh.

Nuts and Bolts.—New demand is still very heavy and makers are not able to make their full output on account of unsatisfactory deliveries of steel by the mills. There is some export demand, but makers are not paying much attention to this on account of the embargoes, and also because they want to conserve their entire output for domestic users. Discounts, which are stated to be for prompt acceptance only, are as follows, delivered in lots of 300 lb. or more where the actual freight rate does not exceed 20c. per 100 lb.:

Machine bolts, h. p. nuts, small, rolled thread, 60, 10 and 5 per cent; small, cut thread, 60 and 10; large, 50 and 10. Machine bolts, c. p. c. and t. nuts, small, 60 per cent; large, 45.

Carriage bolts, small, rolled thread, 60 and 10 per cent; small, cut thread, 60 and 5; large, 50.

Blank bolts, 50 and 10 per cent. Bolt ends, h. p. nuts, 50 and 10; with c. p. nuts, 45. Rough stud bolts, 30. Lag screws (cone or gimlet point), 65. Forged set screws and tap bolts, 25 per cent.

Nuts, tapped or blank, h. p. square, \$3.25 off; h. p. hex., \$3.25 off; c. p. c. & t. sq. nuts, tapped or blank, \$3.50 off; c. p. c. & t. hex., \$3.50 off. Semi-finished hex. nuts, 70, 10 and 10 per cent; finished and case hardened nuts, 70 and 10.

Rivets, 7/16-in. in diameter and smaller, 60.

Wire Rods.—Local makers are not selling in the open market, needing their entire output for their own wire mills and also to take care of regular customers who placed contracts some time ago. It is said that \$60 and even up to \$65 has been offered for Bessemer and open-hearth rods for delivery in two or three months. We quote Bessemer, open-hearth and chain rods at \$60, f.o.b. Pittsburgh.

Wire Products.—The demand for barb wire this spring will not be as heavy as expected on account of the very high prices ruling. The building of new fences by farmers is likely to be put off until the fall months. The demand for nails and wire is very insistent, and where a mill can ship out nails promptly it can obtain premiums of 10c. per keg over the regular price. In fact, one leading maker has been quoting \$2.50 for wire nails for some time. Prices quoted by the mills to domestic consumers for delivery at convenience of the mill are as follows: Wire nails, \$2.40; galvanized, 1 in. and longer, taking an advance over this price of \$2.

and shorter than 1 in., \$2.50; plain annealed wire, \$2.25; galvanized barb wire and fence staples, \$3.25; painted barb wire, \$2.55; polished fence staples, \$2.55; cement coated nails, \$2.40, base, all f.o.b., Pittsburgh, with freight added to point of delivery, terms 60 days, net, less 2 per cent off for cash in 10 days. Discounts on woven wire fencing are now 61½ per cent off list for carload lots; 60½ per cent for 1000-rod lots and 59½ per cent for small lots, f.o.b. Pittsburgh.

Shafting.—Prices are very firm and none of the makers can promise delivery inside of five or six months. Specifications against contracts placed some time ago when prices were much lower than they are now are very active, and much beyond the capacity of makers to supply the material as fast as wanted. We quote cold-rolled shafting at 25 per cent off in carloads and 20 per cent in less than carloads, freight added to point of delivery.

Iron and Steel Bars.—The large mills are naming 2.50c. to 2.65c. on steel bars for delivery in third and fourth quarters of this year, and a number of contracts have been placed at these prices. For delivery in two to three months from 2.75c. to 3c. at mill is quoted. Heavy inquiries are in the market for steel rounds for shrapnel purposes, and it is said two large contracts were placed lately for delivery in fourth quarter and at a very high price. The demand for iron bars is heavy and prices are higher. The mills are sold up for two or three months or longer. We quote steel bars at 2.50c. to 2.65c. for delivery in third and fourth quarter, and from 2.75c. to 3c., at mill, for delivery in second quarter. Prices on steel bars from warehouse range from 3.25c. to 3.50c. We quote common iron bars at 2.50c. to 2.60c. and railroad test bars at 2.60c. to 2.70c. at mill.

Hoops and Bands.—Hoops have sold at 3c. and bands at 2.75c. for delivery in two to three months. Most consumers are covered on contracts made some time ago at much lower prices. We quote steel hoops at 2.75c. and bands at 2.50c. for delivery at convenience of the mill, and for shipment in eight to ten weeks we quote steel hoops at 3c. and bands at 2.75c. at mill.

Merchant Steel.—Mills are filled for three or four months ahead. Shipments of two local makers in March were the heaviest in any one month in their history. Prices quoted are purely nominal, as consumers are covered for some time ahead at much lower prices than are quoted now. On small lots for shipment at convenience of the mill, which would be in four to six months, prices are about as follows: Iron finished tire, ½ x 1½ in. and larger, 2.35c., base; under ½ x 1½ in., 2.50c.; planished tire, 2.55c.; channel tire, ¾ to ¾ and 1 in., 2.85c. to 2.95c.; 1½ in. and larger, 3.25c.; toe calk, 2.95c. to 3.05c., base; flat sleigh shoe, 2.70c.; concave and convex, 2.75c.; cutter shoe, tapered or bent, 3.25c. to 3.35c.; spring steel, 2.95c. to 3.05c.; machinery steel, smooth finish, 2.75c.

Carwheels.—The two local makers have their output of forged steel wheels sold for the remainder of this year, and both have taken contracts for delivery in first quarter of 1917. On the inquiry of the Pennsylvania Railroad for 16,000 steel carwheels it is said the best promise the road could get for delivery was first quarter of next year. We quote 33-in. freight carwheels in lots of 1000 or more at \$18; 33-in. tender wheels, \$22; 36-in. passenger or tender wheels, \$26. These prices are based on a 10-in. diameter hub, 50c. extra being charged for 11-in., all f.o.b., Pittsburgh.

Wrought Pipe.—Mills are sold up on iron and steel pipe for three or four months and cannot take new orders for delivery before third quarter. Several reports they have nearly three times as many actual orders on their books at present as they had at this time last year. No large inquiries are out for gas or oil lines. On account of the high prices ruling for line pipe it is said that several large gas and oil projects have been held up. Discounts on black and galvanized iron and steel pipe are given on another page.

Boiler Tubes.—Specifications against orders for locomotive and boiler tubes are enormously heavy and

all the mills are very much back in deliveries. Discounts on steel and iron tubes are given on another page.

Old Material.—Practically all the sales of scrap made in the past two weeks were by dealers to each other, but a buying movement by consumers is looked for before long. The Carnegie and Cambria steel companies were very heavy buyers of borings and turnings recently for charging into blast furnaces, and the supply of these two grades of scrap has been pretty well cleaned up. Heavy steel scrap has been sold by dealers to each other at \$18 or slightly less, but if a large consumer came in the market it is doubtful if he could pick up much at less than \$18.50. Prices given below can be shaded. Dealers quote for delivery in the Pittsburgh and nearby districts that take the same rates of freight as follows per gross ton:

Heavy steel melting scrap, Steubenville, Folsom, Brackenridge, Sharon, Monessen, Midland and Pittsburgh delivered.....	\$18.25
Hydraulic compressed bundled sheet scrap....	16.50
No. 1 foundry cast	16.25
Bundled sheet scrap, side and ends, f.o.b. consumers' mills, Pittsburgh district.....	14.75
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.....	18.50
Bundled sheet stamping scrap.....	13.25
No. 1 railroad malleable stock.....	16.00
Railroad grate bars	19.50
Low phosphorus melting stock	20.75
Iron car axles	25.50
Steel car axles	22.50
Locomotive axles, steel	25.00
No. 1 busheling scrap.....	15.25
Machine-shop turnings	11.00
Cast-iron borings	11.50
*Sheet bar crop ends	18.00
No. 1 railroad wrought scrap.....	19.00
Heavy steel axle turnings.....	13.50
Heavy breakable cast scrap.....	14.75

*Shipping point.

Coke.—A decided slump has occurred in prices of blast-furnace coke for spot shipment, due to suspensions of shipments on contracts by four or five furnaces, a better car supply and heavier output by ovens. Several sales of best grades of furnace coke were made a few days ago at \$3 per net ton, but the market is lower now and prompt coke could be bought at \$2.75 or lower. Uncertainty prevails as to the price for the last half of the year. One local coke interest states it has closed contracts for last half delivery with the Wheeling Steel & Iron Company, about 6000 tons a month; also with the Lackawanna Steel Company and the Wisconsin Steel Company. All are said to be based on \$3 per net ton at oven, but two of them are said to be trades of coke for steel, so that the price named does not cut much figure. A very large amount of certain blast-furnace cokes now used by consumers who are building by-product coke ovens will be available after July, and this may have the effect of depressing prices on furnace coke for second half delivery. On the other hand, it is believed there will be a serious shortage of labor in the coke regions when the good weather comes, as coal miners will prefer outside jobs that pay \$2.50 to \$2.75 per day. We quote best grades of blast-furnace coke for prompt shipment at \$2.75 to \$3 per net ton at oven, while some grades of coke not so well known are offered at \$2.50; for delivery in last half, \$2.75 to \$3. Three or four makers are refusing to sell coke for last half at less than \$3. We quote best grades of 72-hr. foundry coke at \$3.25 to \$3.50 at oven for prompt shipment and \$3.50 to \$3.75 on contracts. The Connellsville *Courier* gives the output of coke in the Connellsville region for the week ended March 25 as 459,468 net tons, an increase over the previous week of 26,779 tons.

Measurements have been taken by the United States Bureau of Standards of the change of dimension of concrete on a test road on the bureau grounds and also on the Coleman du Pont Road at Millsboro, Del. The results thus far confirm those previously obtained by the bureau on the New Village, N. J., and Nazareth, Pa., roads—that during the winter and spring there is an expansion of the concrete caused by increased moisture content and in the summer a marked contraction caused by loss of moisture. This is contrary to the generally accepted opinion that concrete expands most in midsummer and least in winter.

Chicago

CHICAGO, ILL., April 5, 1916.—(By Wire.)

New business in finished steel products is still largely for railroad uses. Additional rail contracts for a total of 45,000 tons have been placed here, and it is announced that the reservations for the Santa Fe with the Colorado mill will approximate 60,000 tons. Track fastenings have been bought freely, contracts including 16,000 kegs of spikes and 12,000 tons of tie-plates. Prices for both are now higher. Some further orders for car steel for 1917 delivery are likewise noted. Occasional contracts for bolts and for implement bars are being booked, but a dilatory policy on the part of mills that have as yet made no general provision for their customers operates against any great activity. It is also more definitely assured that implement interests not yet covered for last half will make a determined campaign for prices more favorable than the current market before contracting. The exporting of semi-finished steel from this district has been almost entirely discontinued, but the sale of 8000 tons of light rails for Russia is reported. Building work which calls for structural steel is going ahead only where the quantities involved are small, and most of this is being taken by large fabricating shops, smaller operators being handicapped apparently by the scarcity of plain material. Jobbers' stocks at Chicago, despite the steady demand upon them, are well balanced except for the smaller sizes of beams and channels and large plates. Activity in the pig-iron market has moderated, with only a few inquiries of importance outstanding. Sales of Bessemer iron for export to southern Europe by way of the Gulf have been made in this market in the past few days. Prices for scrap are weaker, there being very little buying by consumers.

Pig Iron.—The last week of March fell behind the earlier part of the month in volume of sales as well as inquiry; but with iron contracted for by the foundries quite generally in excess of normal requirements, greater moderation in the rate of buying is a reasonable expectation. Notwithstanding, there remain several inquiries of size yet to be closed, among them one for several thousand tons from a stove manufacturer. As for the local furnaces, sales have already run into such tonnage that remaining capacity in the last half will not long supply the demands even of a quiet market. Recent sales have been consummated for delivery of standard Bessemer iron from local furnaces to southern Europe at prices equivalent to \$21, Valley. Prices for Northern iron have not yet been advanced, a fact attributed in a measure to the low quotations appearing for Southern iron. Quotations for Southern No. 2 as low as \$18.75, Chicago, have been made, and \$19 for prompt shipment iron is being done. In contrast, a sale of 500 tons of iron with silicon 2.50 per cent and over was made on the basis of \$16, Birmingham, for last half. In general, the Southern market, on the basis of delivered prices at Chicago, is on a parity with the market for local iron. For Lake Superior charcoal iron we quote delivery prices at Chicago to include a freight rate of \$1.75. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace, and do not include a switching charge averaging 50c. per ton:

Lake Superior charcoal, Nos. 2 to 5.....	\$19.75
Lake Superior charcoal, No. 1.....	20.25
Lake Superior charcoal, No. 6 and Scotch....	20.75
Northern coke foundry, No. 1.....	19.50
Northern coke foundry, No. 2.....	19.00
Northern coke foundry, No. 3.....	18.50
Southern coke, No. 1 f'dry and 1 soft.....	\$19.50 to
Southern coke, No. 2 f'dry and 2 soft.....	19.50
Malleable Bessemer.....	19.50
Basic.....	19.00
Low phosphorus.....	34.00 to
Silvery, 8 per cent.....	29.50
Bessemer ferrosilicon, 10 per cent.....	33.50

(By Mail)

Rails and Track Supplies.—The week brought out a further placing of rails and track fastenings for delivery in the first quarter of 1917. The Baltimore & Ohio has ordered a small part of its tonnage from Chicago, the Soo Line has bought 14,000 tons and the

Northern Pacific approximately the same quantity. The Santa Fe reservations for 1917 provide for at least 55,000 tons with the Colorado mill, in addition to the 12,000 tons to be rolled at Chicago. The rapid selling of spikes has resulted in another advance in their price and 2.75c. is now a minimum, while for delivery next year an advance of \$3 per ton is asked. The price of tie-plates is now \$50, following a sale of 12,000 tons for 1917, and sales of some smaller lots have been made at that figure. This is an advance of \$5 per ton. A sale of 8000 tons of light rails for Russia is noted. We quote standard railroad spikes at 2.75c., base; track bolts with square nuts, 3.25c. to 3.50c., base, all in car-load lots, Chicago; tie-plates, \$50, f.o.b. mill, net ton; standard section, Bessemer rails, Chicago, 1.25c., base; open hearth, 1.34c.; light rails, 25 to 45 lb., 1.70c.; 16 to 20 lb., 1.75c.; 12 lb., 1.80c.; 8 lb., 1.85c.; angle bars, 1.50c. to 1.75c., Chicago.

Structural Material.—A significant development is the increase of inquiry received by the larger fabricators for apartment building work and for small industrial shops. This apparently points to difficulty on the part of the smaller contractors, who ordinarily handle such work, in securing the necessary material. In the past week local fabricators have taken orders of this kind running from 50 to 200 tons for two apartment buildings, a theater, a foundry and a church structure. Other contracts for fabricated steel include 230 tons for a school building at Fort Hayes, Kan., and 600 tons for a public building at Portland, Ore., placed with the Northwest Steel Company; 300 tons for the Great Western Power Company taken by the Pacific Rolling Mill Company and 675 tons for the Gorgens Building, Oakland, Cal., awarded to the California Steel Company. The general contract for the second section of the Morrison Hotel, Chicago, has been let to the John Griffiths & Son Company. From mill, the only new buying of interest is that for specific work by some of the car builders, the steel to be delivered in 1917. Outstanding inquiry for cars is still limited to the inquiries of the Chicago & Northwestern for 1000 box; Missouri Pacific, 1000 general service; Wabash, 1000 bodies; Illinois Central, 300 stock; Burlington, 500 automobile. We quote for Chicago delivery of plain material from mill 2.539c.

Out of store, the demand has run especially to beams and channels in the sizes from 3 to 6 in., and stocks in these sizes are somewhat depleted. The general demand for structural shapes from stock continues lively. We quote for Chicago delivery from jobbers' stocks 3.10c.

Plates.—Orders for some 7000 tons of plates for 1917 delivery were placed last week, together with scattering purchases for prompt shipment, among which was a lot of 1000 tons on which 3.25c., Pittsburgh, was quoted. The filling of export orders for plates in this district, which for a time involved a considerable tonnage, has been practically discontinued. Reports from plate users regarding receipts of material against contracts indicate that specifications of scheduled quotas are followed by reasonably prompt shipments. We quote for Chicago delivery of plates from mill against contracts 2.789c. and for prompt shipment 3.439c.

With the exception of wide plates in the heavier weights, local stocks are well balanced and the demand from store is being promptly filled. We quote for Chicago delivery of stock 3.50c.

Sheets.—Recent inquiry for both black and blue annealed sheets for early shipment has in several instances brought out no lower quotations than 3.25c., Pittsburgh. For delivery in three to four months there is very little inquiry, particularly as regards black sheets, and prices are not well established. Quotations as low as 2.75c., Pittsburgh, are still reported, although local mills are holding to a minimum \$2 per ton higher. The price of galvanized sheets appears to be prohibitive from the standpoint of the buyer and business is limited to such requirements as admit of no substitute. We quote for Chicago delivery, blue annealed, No. 16 and heavier, 3.089c. to 3.189c.; box annealed, No. 17 and heavier, 3.039c. to 3.189c.; No. 28 galvanized, 4.939c. to 5.189c.

We quote for Chicago delivery from jobbers' stock, minimum prices applying on bundles of 25 or more, as follows: No. 10 blue annealed, 3.25c.; No. 28 black, 3.10c. to 3.20c.; No. 28 galvanized, 5.40c. to 5.50c.

Bars.—The mills report an occasional contract from implement interests but for the most part those who did not participate in the contracting some weeks ago, at prices ranging from 1.90c. to 2.10c., are decidedly loathe to accept the prices now obtaining and efforts have not been abandoned in the direction of securing a special consideration of this tonnage. Bar-iron buying seems not to have been checked by the advance, and the mills have ample business on their books to sustain a strict adherence to the minimum quotation. The price of high-carbon steel is also moving steadily upward. We quote mill shipments, Chicago, as follows: Bar iron, minimum, 2.35c.; soft steel bars, 2.539c.; hard steel bars, 2.50c. to 2.75c.; shafting, in carloads, 30 per cent off; less than carloads, 25 per cent off.

We quote store prices for Chicago delivery: Soft steel bars, 3.10c.; bar iron, 3.10c.; reinforcing bars, 3.10c., base, with 5c. extra for twisting in sizes $\frac{1}{2}$ in. and over and usual card extras for smaller sizes: shafting 15 per cent off.

Wire Products.—The slight fluctuations in the volume of orders for plain wire, nails and fencing, which result in an occasional period, as last week, of reduced business, are still of too little consequence to bring the aggregate down to a normal plane. Reports from the wire mills show that operations are at a gait that will soon make repairs an imperative necessity, and in many instances makeshift expedients are already being practised in the effort to hold production up to the demands made upon it. We continue to quote to jobbers as follows: Plain wire, No. 8 and coarser, base, \$2.439; wire nails, \$2.589; painted barb wire, \$2.739; galvanized barb wire, \$3.439; polished staples, \$2.739; galvanized staples, \$3.439, all Chicago.

Rivets and Bolts.—Manufacturers report the taking of some last-half contracts, but their general attitude evidences their desire to delay committing themselves. Deliveries now being quoted indicate that orders on the books run ahead of production by three or four months. Western makers of rivets are working on orders, a considerable number of which call for Eastern delivery, the demand in this territory having been comparatively of much smaller magnitude. We quote as follows: Carriage bolts up to $\frac{3}{4}$ x 6 in., rolled thread, 60-10; cut thread, 60-5; larger sizes, 50; machine bolts up to $\frac{3}{4}$ x 4 in., rolled thread, with hot pressed square nuts, 60-10-5; cut thread, 60-10; larger sizes, 50-10; gimlet point coach screws, 65; hot pressed nuts, square, \$3.25 off per 100 lb.; hexagon, \$3.25 off. Structural rivets, $\frac{3}{4}$ to 1 $\frac{1}{4}$ in., 3.30c. to 3.40c., base, Chicago, in carload lots, boiler rivets, 10c. additional.

We quote out of store: Structural rivets, 3.50c.; boiler rivets, 3.60c.; machine bolts up to $\frac{3}{4}$ x 4 in., 65-5; larger sizes, 65; carriage bolts up to $\frac{3}{4}$ x 6 in., 65; larger sizes, 50-15 off; hot pressed nuts, square, \$3.70, and hexagon, \$3.80 off per 100 lb., lag screws, 65-10-5.

Cast-Iron Pipe.—Prices have been advanced \$1 per ton. Of the orders placed last week, the leading interest took 450 tons at Chicago and 1150 tons at Cincinnati. The Massillon Iron & Steel Company has been awarded 1000 tons for Toledo, Ohio. A small job of 115 tons, at Findlay, Ohio, was taken by J. B. Clow & Son. New business, for placing in the immediate future, includes no important quantities. We quote as follows, per net ton, Chicago: Water pipe, 4 in., \$33.50 to \$34; 6 in. and larger, \$30.50 to \$31, with \$1 extra for class A water pipe and gas pipe.

Old Material.—Weakness in the scrap market is more pronounced, and is now evident in the prices of all grades of material, except where demands of a special nature are responsible for corresponding quotations. Steel and iron axles continue to command premium prices, a sale of 2000 tons of steel axles at \$26.50 being reported. For further purchases of like importance it is doubtful if this price could be duplicated. A temporary demand for angle bars is also noted, and prices range from \$20 to \$20.50. Steel scrap can be bought at prices 50c. below last quotations, though the appearance of any inquiry for a good sized lot would doubtless stiffen the market at once. Rolling-mill scrap is quotably lower, and foundry grades are decidedly weak. The principal railroad offerings of scrap include a large list from the Baltimore & Ohio, 3500 tons from the Chicago & Northwestern and 3000 tons from the

Wabash. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton	
Old iron rails	\$18.00 to \$18.50
Relaying rails	19.50 to 20.50
Old carwheels	14.00 to 14.50
Old steel rails, rerolling	18.00 to 18.25
Old steel rails, less than 3 ft.	19.00 to 19.50
Heavy melting steel scrap	16.50 to 17.00
Frogs, switches and guards, cut apart	16.50 to 17.00
Shoveling steel	16.25 to 16.50
Steel axle turnings	11.75 to 12.25

Per Net Ton	
Iron angles and splice bars	\$18.50 to \$19.00
Iron arch bars and transoms	19.75 to 20.25
Steel angle bars	15.75 to 16.00
Iron car axles	24.00 to 24.50
Steel car axles	26.50 to 27.00
No. 1 railroad wrought	17.00 to 17.50
No. 2 railroad wrought	15.75 to 16.25
Cut forge	15.75 to 16.25
No. 1 busheling	14.00 to 14.50
No. 2 busheling	16.25 to 16.50
Pipes and flues	12.50 to 12.75
Steel knuckles and couplers	15.50 to 16.00
Steel springs	16.00 to 16.50
No. 1 boilers, cut to sheets and rings	12.25 to 12.50
Boiler punchings	14.00 to 14.50
Locomotive tires, smooth	18.25 to 18.75
Machine shop turnings	8.25 to 8.50
Cast borings	7.00 to 7.50
No. 1 cast scrap	13.00 to 13.50
Stove plate and light cast scrap	11.25 to 11.50
Grate bars	11.00 to 11.25
Brake shoes	11.25 to 11.50
Railroad malleable	14.00 to 14.50
Agricultural malleable	11.50 to 12.00

Philadelphia

PHILADELPHIA, PA., April 4, 1916.

A fair business has been done in foundry iron, and prices are stiffer. Steel-making iron has been advanced, basic now being quoted at \$21 to \$21.50, Philadelphia, and low phosphorus, at \$33, delivered. Buying for prompt and second quarter delivery has been larger than was anticipated, and more is now looked for. In finished steel products there is no notable change, at least so far as prices are concerned, which continue strong. In the first half of this month, the advent of a new quarter, bringing the necessity of specifying material at 2.75c., Pittsburgh, and over, whereas it could have been had on contracts to the end of April at around 1.70c., it is expected that specifications will slow up a bit, consumers using up their lower-priced material before they take on more at the higher levels. Rail buying has been active and more contracts are pending. Contract furnace coke is lagging a little, consumers expecting lower prices, some of their hope being based on the availability of by-product coke. Ferro-alloys are unchanged; premiums having been paid for small lots of spot ferromanganese. For the latter up to \$5.50 per unit has been paid. The old material market shows improvement, and prices have an upward tendency.

Pig Iron.—Buying of foundry iron has been fairly active, although no quantities of exceptional size have figured in the transactions. The buying for second quarter was rather larger than most persons expected. With one firm which booked about 4000 tons in the week deliveries call for 1300 tons for the last half, 1500 tons for the second quarter, 250 tons for the third quarter and the remainder for prompt shipment. The report that the Pennsylvania Railroad was in the market for 3100 tons of foundry iron proves to have been an error arising from its purchasing department having made inquiry for purposes other than buying. The market is exceedingly firm, and \$20.50 is about the minimum for eastern Pennsylvania No. 2 X. While \$21.25, Philadelphia, is the minimum quoted for Virginia No. 2 X, a furnace which has only last half to offer quotes \$21.75, Philadelphia, and 1000 tons is reported to have been taken at the latter price, which equals \$19, furnace. Basic has been without action, but prices are stronger following recent sales, in one of which \$21.50, delivered, was paid. Quotations range from \$21 to \$21.50, delivered. Standard low phosphorus is stronger at about \$33, Philadelphia. A steady business has been done, in and out of this territory. About 5000 tons of Lebanon low phosphorus, which is held at

\$31 to \$32, furnace, has been taken in the week by two or three Eastern consumers for last half delivery. The general freight situation is easier, but some furnaces are still badly hampered, both as regards shipping their product and receiving raw materials. Quotations for standard brands, delivered in buyers' yards, prompt shipment, range about as follows:

Eastern Pa., No. 2 X foundry.....	\$20.50 to \$20.75
Eastern Pa., No. 2 plain.....	20.25 to 20.50
Virginia, No. 2 X foundry.....	21.25
Virginia, No. 2 plain.....	20.75
Gray forge	19.00 to 19.50
Basic	21.00 to 21.50
Standard low phosphorus.....	33.00

Iron Ore.—Arrivals of foreign ore at this port in the week ended April 1 consisted of 4800 tons from Cuba and 2177 tons from Sweden.

Ferroalloys.—The quotation for first half 80 per cent ferromanganese is unchanged at \$175, seaboard, but some of the agents have placed all of that delivery their English principals will permit them to sell. It is estimated that 20,000 to 30,000 tons was sold for first half delivery. When it was first offered it was taken rapidly, but eventually interest lagged, most of the buyers being more anxious to get deliveries this year. For the last quarter \$200 is quoted, and not much is to be had. For spot \$400 appears to be the minimum, on the basis of \$5 per unit, but all kinds of prices over this figure are heard for the small lots available. For a small lot of 50 per cent, \$5.25 per unit has been paid, and more has been offered at higher prices, but it does not appear that many sales have been made. These small sales hardly make the market. Spiegeleisen is scarce and in one case 17 per cent material was offered for \$100 per ton. For last half spiegel, running 18 to 22 per cent manganese, \$60 to \$65 is quoted. With regard to new enterprises undertaking the manufacture of ferromanganese, it is pointed out that some time must elapse before they are a factor in the market. No English ferromanganese arrived at this port last week.

Plates.—Quotations are unchanged at 3.659c. to 3.909c., Philadelphia. A leading mill quoting the higher price as its minimum is selling on that basis for November and December shipment. The railroads are placing orders actively, despite the high prices. Small quantities of plates for which there is imperative need have brought 5.50c., Eastern mill.

Bars.—Steel bars are not quoted by some of the leading makers, and the nominal price is 2.75c., Pittsburgh, equivalent to 2.909c., Philadelphia. Iron bars are unchanged at 2.559c., Philadelphia, but an advance is looked for. Considerable inquiry is out for shell rounds, though some of it is of a tentative character. The price ranges from 4c. to 4.50c.

Billets.—Open-hearth rerolling billets are quoted at \$50 to \$55, and forging steel at \$65 to \$75, according to specifications. It is expected that specifying will diminish a little with the advent of a new quarter, but prices are none the less strong.

Structural Material.—The minimum quoted by eastern Pennsylvania mills continues at 3c., Pittsburgh, or 3.159c., Philadelphia. There is an active demand for fabricated work in this district, most of the jobs being small ones, although negotiations are quietly under way on a proposition which may take 9000 tons. A quieter tendency is expected in the first two weeks of this month in view of the fact that a new quarter has been entered, and many consumers must specify material which will cost them 2.909c., Philadelphia, against the deliveries they have been getting at around 1.859c.

Rails.—Orders for rails have been placed with the Pennsylvania Steel Company as follows: Chesapeake & Ohio, 2000 tons; Atlantic Coast Line, 10,500 tons, and Norfolk & Western, 5000 tons; also an order for 500 tons of girder rails for delivery to the Pacific coast. A large amount of rail business is still pending, including the requirements of the Pennsylvania Railroad and the Philadelphia & Reading.

Sheets.—No 10 blue annealed sheets are unchanged at 3.75c., Pittsburgh, or 3.909c., Philadelphia.

Coke.—The operators are asking \$3 per net ton at oven for last half furnace coke, but the market is drag-

ging, consumers evidently expecting to get a lower price. A few thousand tons have been offered at \$2.85. Consumers are basing their hopes for lower prices partly on the appearance of by-product coke, some of which has been offered. Prompt furnace is quoted at \$3.50 to \$3.75 per net ton at oven. Prompt foundry ranges from \$4 to \$4.25, and contract foundry, July 1 to July 1, at \$3.50. Contract foundry for the remainder of the year is to be had at about \$3.75. Freight rates from the principal producing districts follow: Connells-ville, \$2.05; Latrobe, \$1.85, and Mountain, \$1.65.

Old Material.—The freight situation is easier, and a better business has been done in all directions and for all grades. The quotations for several items are higher. Quotations for delivery in buyers' yards in this district, covering eastern Pennsylvania, and taking freight rates from 35c. to \$1.35 per gross ton, are as follows:

No. 1 heavy melting steel.....	\$18.00 to \$18.50
Old steel rails, rerolling.....	19.00 to 20.00
Low phos. heavy melting steel scrap.....	22.50 to 23.25
Old steel axles.....	26.00 to 27.00
Old iron axles.....	28.00 to 29.00
Old iron rails.....	20.00 to 20.50
Old carwheels.....	17.50 to 18.00
No. 1 railroad wrought.....	23.50 to 24.50
Wrought-iron pipe.....	15.50 to 16.00
No. 1 forge fire.....	15.50 to 16.00
Bundled sheets.....	15.00 to 15.50
No. 2 busheling.....	11.00 to 11.50
Machine shop turnings.....	12.00 to 12.50
Cast borings.....	11.50 to 12.00
No. 1 cast.....	18.00 to 18.50
Grate bars, railroad.....	14.00 to 14.50
Stove plate.....	14.00 to 14.50
Railroad malleable.....	15.00 to 15.50

Cincinnati

CINCINNATI, OHIO, April 5, 1916.—(By Wire.)

Pig Iron.—The open general inquiry, while light, includes 1000 tons of Southern iron for last half shipment for a Kentucky melter and 1500 tons for a northern Ohio consumer for shipment in the first half of next year. Various smaller lots are wanted for delivery in the remainder of the year and in the first quarter and first half of 1917. Among sales reported for shipment this year is one for 1000 tons of mixed Northern and Virginia foundry grades for a central Ohio melter. Another firm in the same locality bought 1000 tons of Northern foundry, with shipments beginning July 1 and extending through the first quarter of next year. Northern resale iron has lately been sold in this territory for spot shipment below the regular market quotation. The sales made were comparatively small lots, and not much more of this iron is available. Considerable interest is being taken in the next year's prices, and it is rumored that some Northern iron has been sold at \$19, furnace, for first quarter and also for first half delivery. Southern furnace producers are slow in opening their books for 1917, and are quoting \$16 to \$16.50 for first half shipment. Some business has been taken at the first-named figure. Southern No. 2 foundry for last half of this year is quoted at \$15.50, Birmingham basis, but this has been shaded. Prompt iron is sold at \$15. No malleable sales have been reported lately, and the price remains for any movement this year at \$19, Ironton. The silvery irons are a little firmer at \$27, furnace, and an Ohio melter bought 400 tons on this basis for this year's shipment. Based on freight rates of \$2.90 from Birmingham and \$1.26 from Ironton, we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 f'dry and 1 soft.....	\$18.40 to \$18.90
Southern coke, No. 2 f'dry and 2 soft.....	17.90 to 18.40
Southern coke, No. 3 foundry.....	17.40 to 17.90
Southern No. 4 foundry.....	16.90 to 17.40
Southern gray forge	16.40 to 16.90
Ohio silvery, 8 per cent silicon.....	28.26 to 28.76
Southern Ohio coke, No. 1.....	21.26
Southern Ohio coke, No. 2.....	20.26
Southern Ohio coke, No. 3.....	19.76
Southern Ohio malleable Bessemer.....	20.26
Basic, Northern	20.26
Lake Superior charcoal	21.20 to 22.20
Standard Southern carwheel.....	25.40 to 25.90

(By Mail)

Coke.—Tangible evidence of the fact that all foundry coke consumers in this territory have not yet contracted ahead is the heavy buying that they are doing at present. Very little is being bought for shipment before July 1, but a large number of contracts have been signed for a year's supply from July 1. Contract prices are practically unchanged, with Connells-ville,

Wise County and Pocahontas operators taking foundry business around \$3.50 to \$3.75 per net ton at oven, but New River producers are holding out for \$4.25 to \$4.50. Connellsville 48-hr. coke is quoted for contract business at \$2.50 to \$3. Spot shipment prices have eased off a little, as the car situation is somewhat improved in some districts.

Finished Material.—Local jobbers are receiving inquiries from Eastern cities and also from dealers in Michigan and Wisconsin, showing plainly that stocks have been depleted on certain kinds of materials in those centers. The inquiries indicate that rounds, 2-in. and over, and heavy plates are very scarce. We quote from warehouse stocks as follows: Steel bars, 3.20c., base; twisted steel bars, 3.25c.; plates, 3.50c.; small structural shapes, 3.20c.; No. 10 blue annealed sheets, 3.25c.; rounds and squares, 2-in. and over, 3.75c.; flats and bars, 1-in. and thicker, 3.75c.; cold-rolled rounds, 5 per cent over list; flats, squares and hexagons, 7 per cent over list. Jobbers' quotations on No. 28 galvanized sheets are around 5.20c. to 5.25c. Mill quotations on No. 28 galvanized sheets are 5.15c. to 5.20c., Cincinnati or Newport, Ky., and on No. 28 black 3.15c. to 3.25c. The wholesale store price on wire nails is firm at \$2.65 per keg, base, and on barb wire \$3.50 per 100 lb.

Old Material.—Rolled steel rails, steel rails for melting, locomotive tires and No. 1 railroad wrought are all in very good demand and advances have taken place on these grades in the past few days. Malleable and steel scrap are also stronger. Shipments to rolling mills are somewhat heavier, but foundry business is about the same. The minimum prices given below represent what dealers are willing to pay for delivery in their yards, southern Ohio and Cincinnati, and the maximum quotations are dealers' prices, f.o.b., at yards:

Per Gross Ton	
Bundled sheet scrap.....	\$12.50 to \$13.00
Old iron rails.....	16.50 to 16.75
Relaying rails, 50 lb. and up.....	22.00 to 22.50
Rerolling steel rails.....	16.00 to 16.50
Heavy melting steel scrap.....	15.25 to 15.75
Steel rails for melting.....	14.50 to 15.00
Per Net Ton	
No. 1 railroad wrought.....	\$14.50 to \$15.00
Cast borings.....	6.50 to 7.00
Steel turnings.....	7.00 to 7.50
Railroad cast scrap.....	12.25 to 12.75
No. 1 machinery scrap.....	14.00 to 14.50
Burnt scrap.....	9.00 to 9.50
Iron axles.....	20.50 to 21.00
Locomotive tires (smooth inside).....	17.50 to 18.00
Pipes and flues.....	10.50 to 11.00
Malleable and steel scrap.....	12.00 to 12.50
Railroad tank and sheet scrap.....	9.50 to 10.00

Cleveland

CLEVELAND, OHIO, April 4, 1916.

Iron Ore.—Owing to the fact that very little additional vessel capacity is to be had, ore men claim that only a very limited amount of ore can be bought for delivery this season, as shippers generally are about sold up for the amount they have been able to cover with vessel capacity. Consumers are well covered, although there may be some demand for ore in the latter part of the season. This will be supplied with difficulty, if at all, because of lack of transportation facilities. Indications are that navigation will not open until about April 20. Dock shipments continue heavy. We quote prices as follows, delivered lower Lake ports: Old range Bessemer, \$4.45; Mesaba Bessemer, \$4.20; old range non-Bessemer, \$3.70; Mesaba non-Bessemer, \$3.55.

Pig Iron.—The market has quieted down materially, although some foundry iron is still being sold in small lots for last half delivery. There is some inquiry for foundry iron for the first half of next year, particularly for Southern iron, but producers generally are refusing to quote for that delivery, although a limited amount of business has been taken in Northern foundry iron for the first quarter at last half prices. One Cleveland producer reports March sales in excess of 170,000 tons. There is practically no change in the price situation. While one Cleveland interest advanced its price 50c. per ton, as noted last week, another Cleveland furnace interest is still quoting foundry iron at \$18.50 for No. 2 for outside shipment and \$19, delivered, Cleveland. The Val-

ley price is firm at \$18.75. An inquiry for 1000 tons of basic iron brought from Valley furnaces quotations ranging from \$18.50 to \$19.25. Southern iron is generally quoted at \$15.50 to \$16, Birmingham, for No. 2, although some iron can still be had for second quarter delivery at \$15. We note a local sale of 500 tons of Ohio silvery 6 per cent silicon iron at \$26 for last half. We quote, delivered Cleveland, as follows:

Bessemer.....	\$21.95 to \$22.45
Basic.....	19.00 to 19.50
Northern No. 2 foundry.....	19.00 to 19.50
Southern No. 2 foundry.....	19.00 to 20.00
Gray forge.....	18.45
Jackson Co. silvery 8 per cent silicon.....	28.62
Standard low phos., Valley furnace.....	32.00

Coke.—The foundry coke market continues quite active. Many foundries are closing contracts, some for last half, but most of them for the full year. We quote standard Connellsville foundry coke at \$3.50 per net ton at oven for delivery during 12 months from July 1; \$3.50 to \$3.75 for last half and \$3.75 to \$4 for prompt shipment.

Finished Iron and Steel.—Specifications are heavy, and the high prices apparently are not curtailing the demand for steel for building and other specific work. New inquiries are pending for four Lake boats for 1917 delivery, the steel for which cannot be furnished before the first quarter of next year. These will require 14,000 tons of plates and structural material. There is considerable inquiry for steel for railroad bridges in lots from 200 to 1500 tons and for other railroad work, including car dumpers and coal tipples. The New York Central Railroad has placed twenty-five additional locomotives with the Lima Locomotive Corporation, making a total of 120 locomotives placed recently, and several other locomotive inquiries are pending. The contract for the steel for the Free Hotel in Cleveland, requiring 3000 tons, has been placed with the American Bridge Company. There is an inquiry for 2000 tons of reinforcing bars for a new terminal warehouse in Cleveland. Quotations on steel for delivery at the convenience of the mills for specific work are being made at 2.50c., Pittsburgh, for steel bars and 2.90c. for plates and structural material. One local mill that has been able to make fairly prompt deliveries is now well sold up on plates until July 1, and is making quotations from 3.75c. to 4c., Pittsburgh. Quotations of another local mill range from 3.25c. to 3.50c. Eastern mills are asking 3.60c. to 4.25c. for plates for delivery in sixty to ninety days. Forging billet contracts are being closed at \$65, Eastern mill, for third quarter. Hard steel bar mills are well sold up and are now making quotations of 2.60c. to 2.75c. Bar iron is quoted at 2.40c., Cleveland. Black and blue annealed sheets are in heavy demand, and the range of quotations is rather wide. We quote black sheets at 2.90c. to 3c., Ohio mill, for No. 28; blue annealed at 2.90c. to 3c. for No. 10 and galvanized at 5c. to 5.15c. for No. 28, but some of the mills are asking higher than 3c. for black and blue annealed. Some blue annealed sheets have been sold at 3.70c. for last-half delivery. Owing to the scarcity of cars some Ohio mills have large quantities of sheets waiting shipment. The Otis Steel Company has resumed operations in its Riverside plant, Cleveland, making sheets and light plates. Warehouse business is very heavy, and stocks are badly depleted. Shafting prices out of stock have been advanced from list to 20 per cent above the list. Other warehouse prices are unchanged at 3.25c. for steel bars and structural material; 3.65c. for plates; 3.50c. for blue annealed sheets and 3.20c. for iron bars.

Bolts, Nuts and Rivets.—Bolt and nut specifications are heavy. While deliveries are slow, makers are endeavoring to take care of their regular trade. So far they are refusing to make contracts for last-half, but will probably do so as soon as the wire mills open their books for that delivery, so they will know the cost of their stock for small bolts. The demand for rivets is unusually heavy, particularly from shipbuilders. The increase in the demand is attributed to the fact that consumers are putting in large stock orders. Some makers are now four months behind on shipments. We quote rivets at 3.25c., Pittsburgh, for structural and 3.35c. for boiler rivets for carload lots for second-

quarter delivery. Some business is being taken at an advance of \$3 a ton for the third quarter, although makers are avoiding contracts beyond July 1 as much as possible. Bolt and nut discounts are as follows:

Common carriage bolts, $\frac{3}{4}$ x 6 in., smaller or shorter rolled thread, 60 and 10; cut thread, 60 and 5; larger or longer, 50; machine bolts with h. p. nuts, $\frac{3}{4}$ x 4 in., smaller and shorter, rolled thread, 60, 10 and 5; cut thread, 60 and 10; larger and longer, 50 and 10; lag bolts, gimlet or cone point, 65; square h. p. nuts, blank or tapped, \$3.25 off the list; hexagon, h. p. nuts, blank or tapped, \$3.25 off; c. p. c. and t. square nuts, blank or tapped, \$3 off; hexagon nuts, all sizes, \$3.50 off; cold pressed semi-finished hexagon nuts, all sizes, 70, 10 and 10 off.

Old Material.—Shipments are very heavy, more favorable weather conditions having started a heavy scrap movement, and material is going to the mills faster than wanted. This is apparently having some effect on the condition of the market. At present it is a buyers' market, and mills are only taking such steel as is offered in small lots at attractive prices. While the market is not firm, there has been no further sagging in prices, which fell off somewhat about ten days ago, and quotations are unchanged. Heavy steel scrap sold in Cleveland two weeks ago at \$18 has been offered without takers at \$17.50 during the last two or three days. The usual railroad lists are out, and these contain quite a heavy tonnage. We quote f.o.b. Cleveland as follows:

Per Gross Ton

Old steel rails	\$17.50 to \$18.00
Old iron rails	19.00
Steel car axles	26.00
Heavy melting steel	17.25 to 17.50
Old carwheels	14.50 to 15.00
Relaying rails, 50 lb. and over	22.50
Agricultural malleable	14.25 to 14.75
Railroad malleable	17.00 to 17.50
Steel axle turnings	13.25 to 13.50
Light bundled sheet scrap	14.00 to 14.25

Per Net Ton

Iron car axles	\$23.00 to \$24.00
Cast borings	8.50 to 8.75
Iron and steel turnings and drillings	8.00 to 8.25
No. 1 busheling	14.50 to 14.75
No. 1 railroad wrought	18.50 to 19.00
No. 1 cast	14.25 to 14.75
Railroad grate bars	11.75 to 12.00
Stove plate	11.75 to 12.00

St. Louis

ST. LOUIS, MO., April 3, 1916.

Pig Iron.—Only one large inquiry came out, 5000 tons of Northern basic, and that is expected to be filled this week. Prices show no change from last reports, but are all very firmly held.

Coke.—Some interest is being shown by melters in July-July contracts for coke, but none has been placed as yet. They seem to be convinced that prices will be no lower and are more or less willing to commit themselves to assure themselves against further advances.

Finished Iron and Steel.—Fabricators are increasingly busy, but have fairly good stocks in their yards now and are able to meet demands upon them, while purchases from warehouses are freely utilized to meet special demands. Considerable new business is appearing on the architects' boards. The United States court has authorized the Missouri Pacific receiver to buy 30,000 tons of rails. Light rails are much stronger and actively in request for small lots. For stock out of warehouse we quote as follows: Soft steel bars, 3.15c.; iron bars, 3.10c.; structural material, 3.15c.; tank plates, 3.55c.; No. 10 blue annealed sheets, 3.30c.; No. 28 black sheets, cold rolled, one pass, 3.30c.; No. 28 galvanized sheets, black sheet gage, 5.60c.

Old Material.—Scrap is fairly well held in rolling mill grades, but the other divisions of the market continue to show the softer tendency previously noted. A test of the situation is expected this week when all the railroad lists are out. Considerable quantities are expected in addition to some heavy figures already out, including 9000 tons from the Wabash, 30,000 to 35,000 tons from the Baltimore & Ohio, 350 tons from a local industry and small lots from the Minneapolis & St. Louis and from the Pullman shops. Relaying rails are hard to get at any price. The opening of the Helmbacher plant at Madison, Ill., has helped to stiffen the

rolling mill grades materially. The St. Louis Screw Company's puddling mill is also having a bearing on the tone of the local market. There are also inquiries indicating the development of some export demand. We quote dealers' prices, f.o.b. customers' works, St. Louis industrial district, as follows:

Per Gross Ton

Old iron rails	\$17.50 to \$18.00
Old steel rails, re-rolling	17.50 to 18.00
Old steel rails, less than 3 ft.	17.00 to 17.50
Relaying rails, standard section, subject to inspection	22.00 to 23.00
Old carwheels	13.75 to 14.25
No. 1 railroad heavy melting steel scrap	16.50 to 17.00
Heavy shoveling steel	15.00 to 15.50
Frogs, switches and guards cut apart	16.50 to 17.00
Bundled sheet scrap	11.00 to 11.50

Per Net Ton

Iron angle bars	\$16.50 to \$17.00
Steel angle bars	14.50 to 15.00
Iron car axles	23.00 to 23.50
Steel car axles	24.50 to 25.00
Wrought arch bars and transoms	19.00 to 19.50
No. 1 railroad wrought	16.75 to 17.00
No. 2 railroad wrought	16.25 to 16.75
Railroad springs	16.00 to 16.50
Steel couplers and knuckles	15.50 to 16.00
Locomotive tires, 42 in. and over, smooth inside	17.50 to 18.00
No. 1 dealers' forge	13.00 to 13.50
Mixed borings	9.00 to 9.50
No. 1 busheling	14.00 to 14.50
No. 1 boilers, cut to sheets and rings	11.50 to 12.00
No. 1 railroad cast scrap	13.00 to 13.50
Stove plate and light cast scrap	10.00 to 10.50
Railroad malleable	12.00 to 12.50
Agricultural malleable	11.00 to 11.50
Pipes and flues	11.00 to 11.50
Railroad sheet and tank scrap	11.00 to 11.50
Railroad grate bars	10.00 to 10.50
Machine shop turnings	10.50 to 11.00

Birmingham

BIRMINGHAM, ALA., April 3, 1916.

Pig Iron.—Some spot iron can be had for \$15, and most last half sales are on the \$15.50 basis. More spot brings \$15.50 perhaps than second half does \$16. Quotations are not uniform, the leading interest naming \$15 and \$15.50 for spot and second half with others nominally at \$15.50 and \$16 for the same deliveries. This does not mean a weak market, but merely that makers are not acting in concert for an advance. One interest booked 3000 tons in small lots during the week at \$15.50 for spot and second half uniformly. This seller had several times tried out the \$16 basis for the second half with only partial success, returning each time to the lower level for actual business worth competing for. The inquiry remains brisk, and an average amount of business was transacted during the week in spite of the enormous sales made early in March. The car shortage is becoming serious. This and labor troubles in the Anniston sanitary pipe shop field account for an increase in stocks on hand. The stocks of iron as of April 1 will show an increase over March 1, as was the case on that date as compared with February 1, owing to these conditions. An increase in steel production will serve to take up a portion of the extra stocks, operations in that line breaking all records. Additional orders for rails, including 45,000 tons for the Southern Pacific, mean a maximum output in that line at Ensley. The large machine shops in Chattanooga and Birmingham are very busy, but the small shops in the South generally have not yet attained capacity operations. Pipe makers are sounding the market. Inquiry for 1917 has appeared, but no orders have yet been booked. We quote, per gross ton, f.o.b. Birmingham district furnaces, as follows:

No. 1 foundry and soft	\$15.50 to \$16.00
No. 2 foundry and soft	15.00 to 15.50
No. 3 foundry	14.50 to 15.00
No. 4 foundry	14.25 to 14.75
Gray forge	14.00 to 14.50
Basic	15.00 to 15.50
Charcoal	23.00 to 23.50

Cast-Iron Pipe.—Operations at water and gas pipe factories are increasing with the advent of the busy season. Specifications in hand warrant steady activity for some time to come. The week's orders from the middle and far West were quite satisfactory. The sanitary shops at Anniston are still having trouble with labor. We quote, per net ton, f.o.b. pipe shop yards, as

follows: 4-in., \$28; 6-in. and upward, \$25, with \$1 added for gas pipe and 16-ft. lengths.

Coal and Coke.—Outside of river movements the coal market is doing only fairly well. The car shortage is acute. The Gulf States Steel Company has resumed at its Virginia mines, where a fire caused a short suspension. Coke is the worst of all sufferers from the car shortage because it has affected production. Any kind of car is now used to move coke. The demand is greater than the supply. Good foundry coke rules at \$4 per net ton, f.o.b. oven, and furnace coke at \$3 to \$3.50.

San Francisco

SAN FRANCISCO, CAL., March 28, 1916.

The spring buying movement is now well under way. Exclusive of export business and special shipbuilding orders, the volume for the first quarter has been largely in excess of that for the previous two years. This increase has been attained in spite of the withdrawal from the market of many speculative projects or those that can be readily delayed, current business being largely from industries which have slighted their routine needs for several years and are now compelled to make extensions. Buyers hesitate to place contracts, except for construction actually under contract, at the present level of prices; on the other hand, it is difficult to get enough material for present needs in many lines, and manufacturers who have been seeking to protect their regular trade are finding it hard to do so.

Bars.—Quite a strong renewal of export inquiry is reported, but few mills take much interest in such business now. The local distributive business is very active, with small shops, mine and mill interests, etc., all buying freely, and merchants are unable to keep any large tonnage on hand. The demand for concrete work is strong. Local mills are well filled and getting steadily farther behind in deliveries. Mill prices on round lots of steel bars for early delivery are now about 3.50c. to 3.60c., San Francisco, and small lots from store are held at 4c.

Structural Material.—Evidence is apparent that a number of important jobs are being held up on account of prices, and new business will no doubt be somewhat restricted on this account. Small jobs, however, have been fairly numerous, and local shops are comfortably busy. Fabricators are receiving a large tonnage on old contracts. Shipbuilders and implement manufacturers are specifying heavily, and a number of new inquiries are coming from such sources. Dyer Brothers have taken about 400 tons for warehouses at Honolulu, and the Pacific Rolling Mill Company has a power station to build in this city for the Great Western Power Company. The Lane Hospital contract has been held up. An inquiry is out for two Government wireless stations in Alaska, and bids will be taken April 17 for a bridge over the Eel River, California. Bonds are to be voted on for several large bridges in the southern part of the State. Plans are under way for a six-story apartment building at Geary and Leavenworth streets, a warehouse at Fremont and Mission streets, and a seven-story addition to the Emporium. It is also announced that the Overland Stores Company, Toledo, Ohio, will build a six-story building on Van Ness Avenue, this city.

Rails.—Small light-rail orders are fairly numerous. Many logging interests have been holding off, and are now scrambling for relayers, which are very scarce.

Plates.—The movement is beyond all precedent for this section. A few additional ship orders have come out, and there is little curtailment in oil tank business. The boiler and tank shops are buying in an unusually large way, while shipbuilders are taking practically all they can get from jobbers, being unable to get enough from the mills. Export shipments passing through this port will soon be augmented by the 40,000 tons recently ordered by Japan for the Toyo Kisen Kaisha ships. Local jobbing prices are on the basis of 4.50c.

Sheets.—The only item to show a marked curtailment in demand due to prices is galvanized sheets, for

which other materials are being substituted as far as possible. Black sheets find slightly more demand, but are never much of a factor here. Blue annealed sheets continue in exceptionally large demand, being needed mainly for tank and pipe work, and consumers are considerably retarded by lack of supplies. Local canners contracted for this year's tin plate long ago at easy prices, but the Japanese canners are now sending in a flood of inquiries, and seem to have great difficulty in placing the business.

Wrought Pipe.—Oil-country business continues very active, with favorable prospects. From some reports, the plumbing sizes are still quiet, but these goods are moving well in some quarters, where merchants are said to have difficulty in accumulating stock. There has been considerable buying lately in anticipation of further advances. A great deal of gas extension is contemplated.

Cast-Iron Pipe.—Business has been rather light for the last fortnight, contracts for public work in California including only about 200 tons for Los Angeles and 300 tons for Calexico. The gas-pipe tonnage, however, is fair. Prices are unchanged at \$35 per net ton for 6-in. and over, \$38 for 4-in., and \$1 extra for class A and gas pipe.

Pig Iron.—A comparatively large tonnage of Eastern and Southern iron is now coming in on contracts. Most of the local foundries are fairly well covered for the remainder of the year, and purchases for prompt shipment are light. Prices are firm at the basis of about \$27 per gross ton for Southern No. 1 foundry.

Coke.—Southern foundry coke is coming in freely, principally on contracts, though a fair tonnage is reported on current orders. Large shipments for the smelters are also coming from the mountain district. There have been inquiries from South America, but sellers do not appear much interested in them. Some sales of Southern coke have been reported at \$17 per net ton, but \$16.50 appears to be about the prevailing price under ordinary conditions.

Old Material.—Steel melting scrap continues in strong demand and is quite firmly held by dealers. Many small scattered lots have lately been absorbed, and values tend upward, though in view of the tonnage still available at outside points it is doubtful if there will be much further advance. Prices remain at the last quotations of \$8 to \$13 per gross ton. Cast-iron scrap continues in good demand, but enough is offered to prevent any great advance, values being about \$14 to \$15 per net ton.

Ferroalloys.—Enough ferrosilicon is now in stock here to meet requirements for some time, and a limited amount of 50 per cent ferromanganese is also offered by one firm, but there is practically no 80 per cent now in sight. The outlook for local production is still somewhat uncertain, though the Noble Electric Steel Company expects to start a furnace April 10 on ferromanganese, another about two weeks later on silicomanganese, and later on a third on ferrochrome. The company is now working a number of ore properties which are expected to take care of the contemplated output without difficulty.

Spanish exports of iron ore in 1915, according to preliminary official estimates, were 4,449,273 metric tons against 6,095,121 tons in 1914, and manganese ore exports were 9136 tons and 8965 tons respectively. The largest exports of iron ore were 8,970,202 tons in 1913, and of manganese ore 67,996 tons in 1907. Pig-iron exports last year were 75,649 tons, against 28,735 tons in 1914. Exports of manufactured iron and steel also largely increased last year, being 50,190 tons against 10,442 tons in 1914.

The supply of high-grade laboratory ware from foreign sources has been greatly curtailed because of the war. American manufacturers have since successfully entered the field. Their names can be obtained from the Bureau of Standards of the U. S. Department of Commerce.

New York

NEW YORK, April 5, 1916.

Pig Iron.—The Eastern market has been rather quieter in the past week. The pace of March was too rapid to be maintained, particularly as a number of furnaces, including several in the Buffalo district, have sold about all but two months' output of the iron they can make in 1916. In Connecticut one interest which was reported last week to have bought 2000 tons has contracted for about as much more. A New England inquiry for a round lot of basic is still pending, but is likely to be closed any day. Several sales are reported in New Jersey, and the International Steam Pump Company is inquiring for 500 tons of No. 2 X foundry for its Elmwood Place plant. The General Electric Company is still in the market for 1500 tons of high silicon iron for second quarter delivery to Everett and Lynn. Eastern Pennsylvania quotations range from \$20 to \$21 for No. 2 X at furnace and for basic makers are quoting around \$21 at furnace. Considerable coke has been sold to foundries and probably 75 to 80 per cent have closed, most of them for delivery to July 1, 1917. On many of these contracts \$3.50 was the basis. The New Haven embargo is still stringently in effect. The Boston & Maine and Boston & Albany accept New York Central delivery, beginning March 30. Lehigh Valley furnace shipments made via Lehigh Valley Railroad in mid-February have just reached Harlem. On the other hand, some D. L. & W. shipments made March 22 reached Harlem in seven days. Considerable lots of forge iron have been placed by a New York State rolling mill company with Buffalo and other furnaces. We quote at tidewater as follows for early delivery: No. 1 foundry, \$20.75 to \$21.25; No. 2 X, \$20.50 to \$20.75; No. 2 plain, \$20 to \$20.50; Southern iron at tidewater, \$20.75 to \$21 for No. 1 and \$20.25 to \$20.50 for No. 2 foundry and No. 2 soft.

Ferroalloys.—The ferromanganese market is quieter than in many weeks. The demand for spot material has been apparently largely satisfied and offerings at \$425 to \$450 have not been accepted. A sale of a lot less than a carload has been made at \$460. The widely circulated report of a sale at \$1,000 per ton has created considerable comment, but no confirmation of such a transaction is obtainable, nor is the price named likely to have been paid when the buyer could have done \$400 to \$450. One holder of a small lot offered it last week, however, at \$1,000. The contract price for the British product remains at \$175, seaboard, for the first half of 1917, and at least 1500 tons has been sold for this delivery in the past week. In all about 18,000 tons has now been contracted for for 1917 and considerable is still available, but buyers are not as eager as they were. Domestic ferromanganese for the last half of this year has been offered at \$200. The 50 to 60 per cent alloy has sold as high as \$5.60 per unit, at furnace, but is obtainable on contract at \$5 per unit. Spiegeleisen, 20 per cent, is quoted at \$65 to \$70, furnace, for last half, with spot material very scarce. The 17 to 19 per cent spiegeleisen has sold as high as \$90 per ton for spot. Ferrosilicon, 50 per cent, is in very strong demand, with makers backward in filling contracts. Spot material has sold as high as \$95 per ton, furnace. The contract price still holds at \$83 to \$85, Pittsburgh. Ferrotungsten is quoted at \$8 to \$10, New York, per lb. of contained tungsten, with the market very erratic. Sales of domestic ore are reported as high as \$105 to \$110 per unit of tungstic oxide in 70 per cent ore. Ferrochromium, 60 to 70 chromium, is quoted at 16c. to 20c. per lb. of contained chromium, New York. Ferrovanadium is selling at \$3 to \$3.25, Pittsburgh, per lb. of contained vanadium. Ferrotitanium, 15 per cent, is quoted at 8c. per lb., f.o.b. plant, for carload lots, 10c. per lb. for ton lots and 12½c. per lb. for small quantities.

Structural Material.—The outlook is regarded bright for an indefinite period, nothing developing to change the forecasts of the last few weeks as given in this column. Plain material is firm at a minimum of 2.50c., Pittsburgh, but that prices will advance is, on the whole,

apparently doubtful. Buyers seem willing to take their chances on coming into the market months hence, seeming to believe that any serious increase in material costs need not be feared. Fabricators, however, consider that they need to make an addition to cover contingencies on future commitments, but have nothing but a vague idea what this protection advance ought to be. Meanwhile a round tonnage of fabricated material has been closed in the East, about 10,000 tons, and considerable new work is active. Among the latter may be mentioned 1000 tons for the Hotel des Artistes, 2 West Sixty-seventh Street; 500 tons for a Y. W. C. A. building, Troy, N. Y.; 250 tons for repair shops for the Seaboard, 500 tons for the Maine Central, 1000 tons for the New York Central, 300 tons for Miami, Fla., 400 tons for the Long Island Reception Hospital and several hundred tons for the Seaboard By-Product Coke Company, Kearney, N. J. The awards include: 2400 tons, Norfolk & Western piersheds, to the Virginia Bridge & Iron Company; 350 tons for the Samuel L. Moore & Sons Corporation, to Levering & Garrigues Company; 500 tons for nine bridges for the Pennsylvania, to the American Bridge Company; 300 tons for the Crucible Steel Company, Syracuse, to the McClintic-Marshall Company; 750 tons for the Cathedral Telephone Exchange, steel to be furnished by the Bethlehem Steel Company; 800 tons for the United Gas Improvement Company at Rochester, N. Y., to the Belmont Iron Works; 400 tons for the Felcourt Realty Company, 42 West Thirty-eighth Street, New York, to the Hedden Construction Company; 250 tons for the Henri Bendel store and loft, 14 West Fifty-seventh Street, to the Harris Silvers Baker Company; 300 tons for a dormitory for Christ Church, West Thirty-sixth Street, to Eidlitz & Ross, and the following to Milliken Brothers; 1400 tons for an office building structure adjoining the Guaranty Trust building, Liberty Street; 200 tons for railroad bridge work in Cuba, and 170 tons for the New York Central, Depew Place. We quote plain material at 2.669c. to 3.169c., New York, with 3.10c., New York, out of warehouse.

Iron and Steel Bars.—The expected strengthening of bar iron is shown in a number of mills bringing their minimum quotations to 2.50c., Pittsburgh. Soft steel bars are elusive, with no indications as yet that the situation will materially improve with the new steel-making capacity which will be available by the middle of the year. Meanwhile agricultural implement makers in the East do not appear to have covered. Inquiries for rounds for shells continue on the basis of deliveries extending into 1917, and round lots have been sold somewhat under 4c., Pittsburgh. On the basis of the rare sales heard of we quote steel bars at 2.75c. to 3c., Pittsburgh, on mill shipments; iron bars, 2.569c. to 2.669c., New York, and iron and steel bars from warehouse at 3.10c., New York.

Steel Plates.—The flood of general inquiry continues, much of it for export. Meanwhile demands for car building are subnormal, and to this extent are helps to the mill situation. About the only new car business to report is 1000 for the Missouri Pacific and 1000 car bodies with steel underframes for the Wabash, these said to have been placed with the American Car & Foundry Company. Some buying of plates in quantity is noted at 3.50c., Pittsburgh, which appears to be the absolute minimum for anything in the first half. We quote mill shipments at 3.669c. to 4.669c., New York, and out of warehouse, where the sizes are irregular, 4c., New York, with an early likelihood of an advance.

Cast-Iron Pipe.—Municipal lettings now coming out are unimportant. Fall River, Mass., will open bids April 7 on 186 tons of 6 to 10-in. On the letting at Hartford, Conn., March 30, of 1565 tons, it is understood that R. D. Wood & Co. were the low bidders. Private buyers are still in the market for good quantities. Carload lots of 6-in., class B and heavier, are held at \$30.50 per net ton, tidewater, class A and gas pipe taking an extra of \$1 per ton.

Old Material.—The market shows steady improvement. Transactions are numerous in all grades of old material. Carwheels have moved in good-sized quantities. Advances are noted in quite a number of com-

modities. Brokers are paying about as follows to local dealers and producers, per gross ton, New York:

No. 1 heavy melting steel scrap (railroad or equivalent).....	\$15.75 to \$16.00
Yard heavy steel (eastern Pa. specifications)	15.25 to 15.75
Relaying rails	23.50 to 24.00
Rerolling rails	17.00 to 17.25
Iron car axles	26.50 to 27.00
Steel car axles	27.50 to 28.00
No. 1 railroad wrought	21.00 to 21.50
Wrought-iron track scrap	18.50 to 19.00
No. 1 yard wrought, long	17.00
No. 1 yard wrought, short	16.00
Light iron	7.50 to 8.00
Cast borings (clean)	9.00 to 9.50
Mixed borings and turnings	8.00 to 8.25
Wrought pipe	13.25 to 13.50
Old carwheels	16.00 to 16.50
Malleable cast (railroad)	12.75 to 13.25

Dealers report a good demand for cast scrap. Quotations to consumers are as follows, per gross ton, New York:

No. 1 cast (machinery)	\$18.00 to \$18.50
No. 2 cast (heavy)	16.50 to 17.00
Stove plate	12.00 to 12.50
Locomotive grate bars	12.00 to 12.50

Buffalo

BUFFALO, N. Y., April 4, 1916.

Pig Iron.—Sales for the week have been only moderate in volume. Inquiries for a total of about 3000 tons of malleable were quoted on at \$19 at furnace, and when the consumer sought to have the orders booked at \$18.75 the offer was turned down by the producing interest. While the situation is about as reported in the past few weeks, signs are appearing to indicate that the demand for iron will far exceed the supply before the end of the year. The same conservative force is present in the iron market to-day that existed in the steel market before the sharp demand came out followed by decided advances in prices, and it simply remains to be seen whether furnacemen and melters are to go through a similar experience. Furnaces of this district are well sold up over the remainder of the year and are not disposed to consider 1917 tonnages on the basis of present prices and in the face of existing conditions. Shipments from furnaces on outstanding contracts are going forward to consumers in heavy volume. We quote, f.o.b. furnace, Buffalo, for current and last half delivery as follows:

No. 1 foundry	\$19.50 to \$20.00
No. 2 X foundry	19.00 to 19.50
No. 2 plain	18.75 to 19.00
No. 3 foundry	18.75 to 19.00
Gray forge	18.50 to 19.00
Malleable	19.00 to 20.00
Basic	19.00 to 20.00
Bessemer	21.00 to 22.00

Old Material.—After the heavy buying in heavy melting steel reported last week the demand has quieted down for the time being. Prices for this commodity, however, are firmly held and prices for other material on the list remain unchanged and firm. Dealers anticipate a resumption of activity shortly and are not inclined to make any concession in prices to secure new business. We quote dealers' asking prices, per gross ton, f.o.b. Buffalo, as follows:

Heavy melting steel	\$18.00 to \$18.50
Low phosphorus steel	21.00 to 21.50
No. 1 railroad wrought scrap	19.00 to 19.50
No. 1 railroad and machinery cast scrap	16.00 to 16.50
Old steel axles	24.00 to 24.50
Old iron axles	24.00 to 24.50
Old carwheels	15.25 to 15.75
Railroad malleable	16.00 to 16.50
Machine shop turnings	8.50 to 9.00
Heavy axle turnings	12.50 to 13.00
Clean cast borings	9.25 to 9.75
Old iron rails	18.00 to 18.50
Locomotive grate bars	12.00 to 12.50
Stove plate (net ton)	11.50 to 12.00
Wrought pipe	14.00 to 14.50
Bundled sheet scrap	13.00 to 13.50
No. 1 busheling	15.00 to 15.50
No. 2 busheling	12.00 to 12.50
Bundled tin scrap	15.00 to 15.50

Finished Iron and Steel.—As spring comes on the pressure is being increased for the delivery of material ordered last fall. Users are more concerned about the delivery of material already ordered than they are regarding the making of new purchases. A canvass of the architects in this district shows a comparatively small amount of new large construction work; and in a

number of instances where public buildings, such as schools, were under advisement it was found the costs, with structural steel at the advanced prices, exceeded the appropriations, and they are being redesigned for concrete construction. The threaded rods and bolts for the Donner Steel Company's ore dock, Buffalo, 800 tons, have been taken by the Pittsburgh Screw & Bolt Company, the steel going to the Carnegie Steel Company. The Lackawanna Steel Company has booked an order for 5500 tons of 100-lb. steel rails for the Buffalo, Rochester & Pittsburgh Railroad.

British Steel Market

Italy Inquiring for Rails—General Conditions Strong—American Tin Plate Offered

(By Cable)

LONDON, ENGLAND, April 5, 1916.

Pig-iron warrants are strong on large withdrawals from warehouses. The export price of Cleveland iron is nominally about 100s. Hematite iron for last half is 139s. Small quantities of American tin plate are offered at about 25s. 9d. per 100 lb. c.i.f. Liverpool for prompt shipment. The semi-finished steel scarcity increases. Italy is inquiring for about 30,000 tons of rails. Quotations, partly nominal, of some materials are as follows:

Tin plates, coke, 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 32s., against 31s. last week.

Cleveland pig-iron warrants, 86s. 6d.

Steel black sheets, No. 23, export f.o.b. Liverpool, £19 15s.

Steel ship plates, Scotch, delivered local yards, £13 10s.

Steel rails, export, f.o.b. works, port, £11.

Hematite pig iron, f.o.b. Tees, about 139s. against 135s. a week ago.

Sheet bars (Welsh) delivered at works in Swansea Valley, £13 10s.

Steel bars, export, f.o.b. Clyde, £18 compared with £17 10s. a week ago.

Ferromanganese, £35, nominal.

Ferrosilicon, 50 per cent, c.i.f., £27.

Exports Further Restricted by Government—Ferromanganese Contracts Good

(By Mail)

LONDON, ENGLAND, March 21, 1916.—The labor situation continues to be viewed with considerable anxiety and market conditions are still very complex. The latest development has been the circular issued by the Ministry of Munitions, intimating that merchants and manufacturers are not to accept further export business in iron and steel products without the sanction of the authorities. The object is doubtless intended to place exports under strict control.

Indications point to an accentuation of the already serious scarcity of pig iron which precludes any setback in prices. The total output in the United Kingdom for the past year, according to official returns, amounts to 8,793,659 gross tons against 9,006,000 tons for 1914, a decrease of nearly 250,000 tons. It is quite possible that the output of the current year will shrink further through labor and raw material difficulties.

The feature has been the Scandinavian demand in the market for Cleveland foundry iron, and makers, who are bare of stocks, were not easy to deal with, although the prospect of export restrictions is unsettled. Domestic consumers are short of iron and clamoring for deliveries. While the home trade price remains at 82s. 6d., the maximum fixed recently for export, business has been done for spring shipment, at 90s. The hematite market is practically unchanged, the export quotation for East Coast remaining at 140s. The difficulty encountered as to the enforcement of the maximum price for home consumers has been overcome by the authorities, by dropping the sliding scale as to ore, and by the steps taken to lower ore freights by placing all chartering in the hands of an official in London.

The chronic scarcity of semi-finished steel shows no abatement, with an eager demand for anything obtainable, especially for nearby delivery. The difficulty

experienced by manufacturers in keeping up their quotations is aggravated by the poor deliveries from foreign sources through shipping delays. Welsh bars are quoted £13.10, nominal, a ton, delivered at works locally, and domestic billets remain nominal at about £13. Occasionally low freight rates are secured for American material, and this has somewhat facilitated new business, but the prices paid show considerable irregularity according to freight.

It is understood that good quantities of ferromanganese have been booked for shipment to America after midsummer, the fulfillment of contracts being, of course, subject to Government control with licenses rather hard to get.

Great pressure in working conditions exists in finished material chiefly because of the huge Government requirements which are having primary consideration. Merchant business thus stands but a poor chance, regardless of the tempting export prices. The influx of inquiries is as great as ever in the Midlands, and the basis on which business has to be conducted is now better understood from the schedule of maximum prices drawn up, which is as follows:

Finished iron: Marked bars, £14 15s., unmarked (crown quality) iron, £13 5s. Pig iron: Cold blast, £8 17s. 6d. forge and foundry; cylinder iron (Earl of Dudley's brand), £7 17s. 6d.; hot-air iron, £7 forge, £7 10s. foundry; all mine, £5 10s., forge and foundry; part-mine, £4 10s. forge and £4 12s. 6d. foundry; common iron, £4 5s., forge and foundry.

The above prices are all net and free on rail. The maximum rates for Derbyshire and Northamptonshire irons have already been fixed at 85s. to 87s. 6d. and 82s. 6d. to 85s., respectively. All these prices are liable to be revised given any important change in the cost of labor and raw materials.

Locomotive Orders Continue Large

Locomotive buying continues very heavy. In the past week over 175 have been ordered and inquiries have appeared for over 140. The American Locomotive Company is to build 70 locomotives for the Russian Government, 10 switching engines for the New York, Chicago & St. Louis, and 6 of the same type for the Minneapolis & St. Louis, besides 6 for the Chicago, Indianapolis & Louisville. It is reported but not confirmed that the Missouri Pacific has ordered 30 locomotives from the American Locomotive Company and that the St. Louis & Southwestern has placed orders for 20, the builder not being designated. The Baldwin Locomotive Works will construct 25 Mikado locomotives for the Pennsylvania Lines West, which is additional to the 25 of the same type ordered from the Lima Locomotive Corporation a week ago. The same builder will also furnish the Atlantic Coast line with 10 Pacific and 2 switching locomotives. The Delaware, Lackawanna & Western will build 10 switching locomotives in its own shops.

The Norfolk & Western is inquiring for 30 Mallet locomotives, while the Atchison, Topeka & Santa Fe is to purchase 75 or 100 locomotives.

Orders in March are estimated to amount to 453, as compared with 565 in February and 353 in January. The total for the first quarter is therefore 1371, or at the rate of 457 per month, which compares with a total of 1972 ordered in 1915, at the rate of 164 per month. Orders at present are therefore nearly three times those of the average of 1915. Of the total ordered so far this year 250 were foreign locomotives.

Standard Molding Sand

As a result of a recent meeting of the committee, appointed by the American Foundrymen's Association at its last annual meeting, with representatives of the U. S. Bureau of Standards, to consult on problems in which the bureau could be of some help, an investigation is to be undertaken looking to the establishment of a standard molding sand. Other matters considered were facing sands, core-binder standards, standard sieves, and shock and other suitable mechanical tests of malleable castings.

Iron and Industrial Stocks

NEW YORK, April 5, 1916.

The general tendency of the stock market is upward, despite the persistent uncertainties of international relations. Continued buoyant business reports and heavy gains in railroad earnings are dominating influences for the time being. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week was as follows:

Allis-Chal., com. 28 3/4 - 30 1/4	Republic, pref. 108 1/2 - 109
Allis-Chal., pref. 77 - 78 1/2	Sloss, com. 55 3/4 - 56 1/2
Am. Can., com. 60 1/2 - 62 1/2	Pipe, com. 21 3/4 - 22 1/2
Am. Can., pref. 111 3/4	Pipe, pref. 51 3/4 - 52
Am. Car & Fdry., com. 67 1/2 - 71 1/4	U. S. Steel, com. 83 1/2 - 86
Am. Loco., com. 76 1/2 - 82 1/4	U. S. Steel, pref. 116 1/4 - 116 3/4
Am. Loco., pref. 103 1/2 - 104 3/4	Va. I. C. & Coke. 51
Am. St. Foundry 50 1/2 - 53	Westg. Electric. 64 3/4 - 66 3/4
Bald. Loco., com. 103 1/4 - 109 3/4	Am. Radiator, com. 39 3/4
Bald. Loco., pref. 108 - 108 1/2	Am. Ship, com. 46 - 47
Beth. Steel, com. 451 - 494	Am. Ship, pref. 88 1/2 - 90
Beth. Steel, pref. 135	Chic. Pneu. Tool. 70 3/4 - 74
Case (J. I.), pref. 85 1/4	Cambria Steel. 80 - 81 1/4
Colorado Fuel. 43 3/4 - 46	Lake Sup. Corp. 10 1/4 - 10 3/4
Deere & Co., pref. 94 1/2 - 95	Pa. Steel, com. 80
Gen. Electric. 166 - 168 1/2	Pa. Steel, pref. 98 - 98 1/2
Gt. No. Ore Cert. 43 - 44 1/2	Warwick. 10 3/4 - 10 3/4
Int. Harv. of N. J., com. 110 1/2 - 111	Crucible St., com. 88 - 96 3/4
Int. Harv. of N. J., pref. 118	Crucible St., pref. 114 3/4 - 116 3/4
Int. Harv. Corp., com. 73	Harb.-Waik. Refrac. com. 84 1/2
Lacka. Steel. 76 1/4 - 78 3/4	Harb.-Waik. Refrac. pref. 5
Nat. Enam. & Stm., com. 24 1/4 - 25	La Belle Ir., com. 52 1/2 - 53 3/4
Nat. Enam. & Stm., pref. 96	La Belle Iron, pref. 128
N. Y. Air Brake. 142 - 147 1/2	Am. Brit. Mfg., com. 24 - 24 1/2
Pitts. Steel, pref. 99	Carbon St., com. 75 - 76
Pressed St., com. 52 - 54 1/2	Cent. Fdry., com. 11 1/2 - 12
Pressed St., pref. 102 - 102 1/2	Cent. Fdry., pref. 23
Ry. St. Sp., com. 39 1/2 - 41 1/4	Driggs-Seabury. 138 - 142
Ry. St. Sp., pref. 96	Midvale Steel. 64 3/4 - 67 3/4
Republic, com. 50 - 52 3/4	

Dividends

The Atlantic Steel Company, initial quarterly, 1 1/2 per cent, payable April 10.

The New Jersey Zinc Company, extra, 10 per cent, payable April 10. Three months ago an extra disbursement of 10 per cent was declared.

The American Window Glass Machine Company, 16 per cent on the preferred stock, payable April 14.

The Chicago Pneumatic Tool Company, regular quarterly, 1 per cent, payable April 25.

The Singer Mfg. Company, regular quarterly, 2 per cent, payable March 31.

The Westinghouse Air Brake Company, \$2, payable April 21.

The American La France Fire Engine Company, regular quarterly, 1 3/4 per cent on the preferred stock, payable April 1.

The Pittsburgh Steel Company, 2 per cent on the common stock, payable April 1.

The Crocker-Wheeler Company, regular quarterly, 1 1/2 per cent on the preferred stock, and 1 1/2 per cent on the common, payable April 15.

Shenango Furnace Company Ores for 1916

The Shenango Furnace Company and W. P. Snyder & Co., Pittsburgh, have issued a booklet giving their Lake Superior iron-ore analyses for 1916. These include the Shenango, Webb and Tioga Mesaba Bessemer ores; the Wilpen, Webb and Whiteside Mesaba non-Bessemer ores, and the Clifford and Antoine silicious ores of the Menominee range. In the case of the Webb Bessemer ore there is a marked decrease in the iron content. The analysis shown in the 1915 list on this ore gives 60.47 per cent metallic iron, 0.40 phosphorus and 6.93 silica, while the 1916 analysis gives the iron content as 53.52, phosphorus 0.035 and silica 6.13.

Austria-Hungary's Steel Output in 1915

The steel output of Austria-Hungary in 1915, as furnished to *Stahl und Eisen* by F. Schuster, of Vienna, was 2,686,226 metric tons, comparing with 2,190,759 tons in 1914 and 2,682,619 tons in 1913. The year's output was distributed as follows: Bessemer steel, 241,690 tons; open-hearth steel ingots and castings, 2,370,947 tons; puddled iron and steel, 23,543 tons; crucible steel, 26,151 tons; electric steel, 23,895 tons. Austria produced 1,978,802 tons of the 1915 total; Hungary, 688,267 tons, and Bosnia, 19,157 tons.

Finished Iron and Steel f.o.b. Pittsburgh

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16.9c.; Philadelphia, 15.9c.; Boston, 18.9c.; Buffalo, 11.6c.; Cleveland, 10.5c.; Cincinnati, 15.8c.; Indianapolis, 17.9c.; Chicago, 18.9c.; St. Louis, 23.6c.; Kansas City, 43.6c.; Omaha, 43.6c.; St. Paul, 32.9c.; Denver, 68.6c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 73.9c. on plates, structural shapes and sheets, and 65c. on wrought pipe and boiler tubes. The foregoing rates to the Pacific coast are by rail.

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs, 1/4 in. thick and over, and zees 3 in. and over, 2.50c. to 2.75c. Extras on other shapes and sizes are as follows:

	Cents per lb.
I-beams over 15 in.	.10
H-beams over 18 in.	.10
Angles over 6 in. on one or both legs.	.10
Angles, 3 in. on one or both legs less than 1/4 in. thick, as per steel bar card, Sept. 1, 1909.	.70
Tees, structural sizes (except elevator, handrail, car truck and conductor rail).	.05
Channels and tees, under 3 in. wide, as per steel bar card, Sept. 1, 1909.	.20 to .30
Deck beams and bulb angles.	.30
Handrail tees.	.75
Cutting to lengths, under 3 ft. to 2 ft. inclusive.	.25
Cutting to lengths, under 2 ft. to 1 ft. inclusive.	.50
Cutting to lengths, under 1 ft.	1.55
No charge for cutting to lengths 3 ft. and over.	

Plates.—Tank plates, 1/4 in. thick, 6 1/4 in. up to 100 in. wide, 2.75c. to 3.75c., base, net cash, 30 days. Following are stipulations prescribed by manufacturers:

Rectangular plates, tank steel or conforming to manufacturers standard specifications for structural steel dated Feb. 6, 1903, or equivalent, 1/4 in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered 1/4 in. plates. Plates over 72 in. wide must be ordered 1/4 in. thick on edge or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft. down to the weight of 3/16 in. take the price of 3/16 in.

Allowable overweight, whether plates are ordered to gage or weight to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras	Cents per lb.
Gages under 1/4 in. to and including 3/16 in.	.10
Gages under 3/16 in. to and including No. 8.	.15
Gages under No. 8 to and including No. 9.	.25
Gages under No. 9 to and including No. 10.	.30
Gages under No. 10 to and including No. 12.	.40
Sketches (including straight taper plates), 3 ft. and over.	.10
Complete circles, 3 ft. in diameter and over.	.20
Boiler and flange steel.	.10
"A. B. M. A." and ordinary firebox steel.	.20
Still bottom steel.	.30
Marine steel.	.40
Locomotive firebox steel.	.50
Widths over 100 in. up to 110 in., inclusive.	.05
Widths over 110 in. up to 115 in., inclusive.	.10
Widths over 115 in. up to 120 in., inclusive.	.15
Widths over 120 in. up to 125 in., inclusive.	.25
Widths over 125 in. up to 130 in., inclusive.	.50
Widths over 130 in.	1.00
Cutting to lengths under 3 ft. to 2 ft., inclusive.	.25
Cutting to lengths under 2 ft. to 1 ft., inclusive.	.50
Cutting to lengths under 1 ft.	1.55
No charge for cutting rectangular plates to lengths 3 ft. and over.	

Wire Rods.—Bessemer, open-hearth and chain rods, \$60, nominally.

Wire Products.—Prices to jobbers, effective Feb. 29: Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days or 2 per cent discount in 10 days, carload lots, annealed, \$2.25; galvanized, \$2.95. Galvanized barb wire and staples, \$3.25; painted, \$2.55. Wire nails, \$2.40. Galvanized nails, 1 in. and longer, \$2 advance over base price; shorter than 1 in., \$2.50 advance over base price. Woven wire fencing, 6 1/2 per cent off list for carloads, 60 1/2 off for 1000-rod lots, 59 1/2 off for less than 1000-rod lots.

The following table gives the price per 100 lb. to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Nos.	0 to 9	10	11	12	12 1/2	13	14	15	16
Annealed	\$2.30	\$2.35	\$2.40	\$2.45	\$2.60	\$2.70	\$2.80	\$2.90	\$2.90
Galvanized	3.20	3.25	3.30	3.35	3.40	3.55	3.90	4.00	

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card in effect from March 29, 1916, on black and galvanized steel and iron pipe, all full weight:

Steel		Butt Weld		Iron	
Inches	Black	Galv.	Inches	Black	Galv.
1/4, 1/2 and 3/4	65	33 1/2	1/4 and 1/2	54	22
1/2	69	49 1/2	3/4	55	23
3/4 to 3	72	53 1/2	1/2	59	36
			3/4 to 1 1/2	62	41

		Lap Weld			
2	68	49 1/2	1 1/4	51	30
2 1/2 to 6	71	52 1/2	1 1/2	57	37
7 to 12	67	47 1/2	2	58	38
13 and 14	58 1/2	..	2 1/2 to 4	60	41
15	56	..	4 1/2 to 6	60	41
			7 to 12	58	39

<i>Reamed and Drifted</i>					
1 to 3, butt.....	70	51½	¾ to 1½, butt...	60	39
2, lap.....	66	47½	1¼, lap.....	49	28
2½ to 6, lap.....	69	50½	1½, lap.....	55	35
			2, lap.....	56	36
			2½ to 4, lap....	58	38

Butt Weld, extra strong, plain ends					
1/8, 1/4 and 3/8.....	61	38 1/2	1/8, 1/4 and 3/8....	54	32
1/4.....	66	48 1/2	1/2.....	59	41
3/8 to 1 1/2.....	70	52 1/2	3/4 to 1 1/2.....	63	43
2 to 3.....	71	53 1/2			

Blue Annealed Sheets		Box Annealed Sheets, Cold Rolled	
Nos. 3 to 8	2.85 to 2.95	Nos. 17 to 21	2.65 to 2.70
Nos. 9 to 10	2.90 to 3.00	Nos. 22 and 24	2.70 to 2.75
Nos. 11 and 12	2.95 to 3.05	Nos. 25 and 26	2.75 to 2.80
Nos. 13 and 14	3.00 to 3.10	No. 27	2.80 to 2.85
Nos. 15 and 16	3.10 to 3.20	No. 28	2.85 to 2.90
		No. 29	2.90 to 2.95
		No. 30	3.10 to 3.15

Above prices are for Bessemer stock. For open-hearth stock \$2 per ton advance is charged.

Galvanized Sheets of Black Sheet Gage	
Nos. 10 and 11	4.00 to 4.25
No. 12	4.10 to 4.35
Nos. 13 and 14	4.10 to 4.35
Nos. 15 and 16	4.20 to 4.45
Nos. 17 to 21	4.35 to 4.60
Nos. 22 and 24	4.55 to 4.80
Nos. 25 and 26	4.70 to 4.95
No. 27	4.85 to 5.10
No. 28	5.00 to 5.25
No. 29	5.15 to 5.40

Above prices are for Bessemer stock. For open-hearth stock \$2 per ton advance is charged.

Boiler Tubes.—Discounts on less than carloads, f.o.b. Pittsburgh, freight to destination added, on lap-welded steel tubes, in effect from March 29, 1916, and standard charcoal-iron tubes, effective from Feb. 29, 1916, are as follows:

Lap Welded Steel		Standard Charcoal Iron	
1 1/2 in.	39	1 1/2 in.	37 to 38
1 3/4 and 2 in.	51	1 3/4 and 2 in.	41 to 42
2 1/4 in.	48	2 1/4 in.	38 to 39
2 1/2 and 2 3/4 in.	54	2 1/2 and 2 3/4 in.	45 to 46
3 and 3 1/2 in.	59	3 and 3 1/2 in.	49 to 50
3 1/2 to 4 1/2 in.	60	3 1/2 to 4 1/2 in.	51 to 52
5 and 6 in.	53	5 and 6 in.	45 to 46
7 to 13 in.	50		

Locomotive and steamship special charcoal grades bring higher prices.

1 1/4 in., over 18 ft., and not exceeding 22 ft., 10 per cent net extra.

2 in. and larger, over 22 ft., 10 per cent net extra.

Metal Markets

The Week's Prices

Cents Per Pound for Early Delivery							
Copper, New York		Tin, New York		Lead, New York		Spelter, New York	
Mar.	Lake	Electro-lytic	New York	New York	St. Louis	New York	St. Louis
29.....	27.12½	26.87½	49.50	8.00	7.87½	17.75	17.50
30.....	27.12½	26.87½	49.00	8.00	7.75	17.75	17.50
31.....	27.12½	26.87½	49.00	8.00	8.00	17.75	17.50
April							
1.....	27.12½	26.87½	49.50	8.00	8.00	17.75	17.50
3.....	27.50	27.12½	50.50	8.00	8.00	17.75	17.50
4.....	27.50	27.37½	50.62½	8.00	8.00	17.75	17.50

NEW YORK, April 5, 1916.

Copper is higher, following an extremely large business for export. Tin is a little higher because of continued uncertainty over British shipping licenses. The outside lead market was strengthened by the action of the leading interest in advancing its quotation \$10 per ton. Spelter is fairly active and has a stronger tone. Antimony is quiet but firm.

New York

Copper.—In the past few days foreign governments, notably Great Britain and France, have purchased enormous quantities of copper in this market, some estimates placing the total at around 100,000,000 lb. Further buying, also on European account, is expected. The bulk of the metal taken was electrolytic for delivery in June, July and August, at about 27c., 30 days delivered, or 26.87½c., cash, New York, while a good quantity of Lake was taken also at prices which ranged up to 27.50c., cash. The buying was conducted quietly, large purchases being made of one producer on one day, and of another on the next, a method which kept the market quiet and did not cause prices to advance until the movement was well under way. All of the metal taken was for war consumption, the demand for ordinary and peaceful purposes not being out of the ordinary. On Monday there was heavy buying of electrolytic at 27.50c., 30 days delivered, and slightly less, although the day closed strong at 27.50c. Yesterday electrolytic was unobtainable under 27.50c. and some sellers asserted that they were sold up to August. Prompt copper was to be had in limited quantity at about ½c. higher, but the real market is entirely in June, July and August. Lake was 27.50c., cash. Statistics from Europe show that the French and British stocks continue to dwindle, the total on March 31 being but 5528 tons, against 9811 tons Feb. 29. The exports in March totaled 24,006 tons.

Copper Averages.—The average price of Lake copper for the month of March, based on daily quotations in THE IRON AGE, was 27.10c., and for electrolytic, 26.70c.

Tin.—In the last few days of March the market was mostly dull, although on Wednesday and Thursday there was some demand for futures which resulted in business. On Monday probably 300 tons of Eastern shipments changed hands, and yesterday about 200 tons. For April delivery demand was good, but there were few sellers because of the continued difficulty of obtaining licenses to ship from England. Persons who ordinarily are sellers were more anxious to buy than to sell April tin. Shipment from London is so uncertain that tin in that city has been unsalable, even when offered at 1½c. per lb. less than the price of that on which April delivery is assured. The American Smelting & Refining Company announces that it is ready to supply Perth Amboy tin from Bolivian concentrates to those who wish to try it out experimentally. The statistics for March show that the deliveries for that month totaled 4726 tons, and that March 31 there was in stock and landing 2746 tons. The quantity now afloat is 4785 tons. The total visible supply March 31 was 18,782 tons, against 16,511 tons a month previous. The quotation yesterday for spot tin was 50.62½c.

Lead.—About the middle of last week a weaker tendency developed, especially in St. Louis shipments, and the trade was beginning to think that the quotations of the independent producers and of the American

Smelting & Refining Company would draw together. On Thursday morning the metal had sold at 7.75c., East St. Louis, but at noon on that day the principal producer announced an advance of \$10 per ton, making its New York quotation 7.50c. The trade was puzzled over the advance and could not reconcile the action with the statement issued by the company a few days ago, wherein it stated that it did not believe that extraordinary war demands should force domestic industry to pay prices that are not warranted by domestic consumption. The effect of the advance was to stiffen the market immediately, and again place it on an 8c. level both at New York and St. Louis. In fact, last Friday 8.25c., Chicago, was done for domestic delivery. In trying to fathom the advance, sellers point out that for a considerable part of March the big interest was not selling at its quoted price of 7c. It also commented that because of its superior foreign connections the large company was in a position to see an end to the lull in foreign buying. Since last Saturday there has been a good demand for both domestic and foreign shipment. The March exports totaled 4151 tons.

Spelter.—The market has been moderately but steadily active, and has a better tone. The New York quotation yesterday was 17.75c. to 18c., and that at St. Louis, 17.50c. to 17.75c. In view of the heavy buying of copper in the past few days it is believed that a revival of foreign demand for spelter is near. The brass mills have been buying less heavily because they have fewer new and large contracts to cover. The exports in March totaled 1705 tons.

Antimony.—The market for Chinese and Japanese grades is quiet but firm at 45c. to 46c., duty paid, for nearby delivery.

Aluminum.—The market is quiet at 59c. to 61c. for No. 1 virgin aluminum, 98 to 99 per cent pure.

Old Metals.—The market is quiet. Dealers' selling prices are nominally unchanged, as follows:

	Cents per lb.
Copper, heavy and crucible.....	25.00 to 26.00
Copper, heavy and wire.....	24.00 to 25.00
Copper, light and bottoms.....	20.00 to 21.00
Brass, heavy.....	15.00 to 15.50
Brass, light.....	12.50 to 13.00
Heavy machine composition.....	18.00 to 19.00
No. 1 yellow rod brass turnings.....	16.00 to 16.50
No. 1 red brass or composition turnings.....	16.00 to 17.00
Lead, heavy.....	5.75
Lead, tea.....	5.25
Zinc.....	14.00 to 15.00

Chicago

APRIL 3.—A period of active trading in metals last week, while it established the market on a decidedly firmer basis, brought few changes in prices, advances being limited to fractional increases. We quote: Casting copper, 26.50c.; Lake copper, 28c.; tin, carloads, 51c., and small lots, 53c.; lead, 8.25c.; spelter, 17.75c. to 18c.; sheet zinc, 25c.; Cookson's antimony, 50c.; other grades, 48c. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 22c.; copper bottoms, 20c.; copper clips, 21c.; red brass, 18c.; yellow brass, 14c.; lead pipe, 6.50c.; zinc, 13.50c.; pewter, No. 1, 28c.; tinfoil, 37.50c.; block tin pipe, 42.50c.

St. Louis

APRIL 3.—Non-ferrous metals continue strong, and the demand is active, considering the high quotations and their tendency to restrict business. Quotations today are: Lead, 8.25c.; spelter, 19c.; tin, 55c.; Lake copper, 29c.; electrolytic copper, 28.50c.; Asiatic antimony, 49c. In the Joplin ore district zinc blende brought as high as \$115 per ton, basis of 60 per cent, ranging down to \$85 on lower grades, with top settlements for premium ores \$121. The average for the week's production was \$100. Calamine ranged from \$75 to \$87, basis of 40 per cent, with the average for the week \$84. Lead ore sold at \$100, basis of 80 per cent, with the average for the week \$99. On miscellaneous scrap metals we quote dealers' buying prices as follows: Light brass, 10.50c.; heavy yellow brass, 13.50c.; heavy red brass and light copper, 16c.; heavy copper and copper wire, 20c.; tinfoil, 33c.; pewter, 24c.; zinc, 12c.; lead, 5.50c.; tea lead, 3.50c.

Pittsburgh and Nearby Districts

Directors of the Pittsburgh Steel Company, Frick Building, Pittsburgh, last week authorized a resumption of dividends on the common stock, declaring 2 per cent on that issue, payable April 1. Earlier in the year the back dividends on the preferred were paid off, and since then the regular 1½ per cent quarterly has been declared on that class of stock. The company will shortly issue a call anticipating a payment of \$850,000 of its 6 per cent notes, not due until Jan. 1, 1919, which, together with the \$150,000 recently bought, will make a total of \$1,000,000 redeemed three years in advance of maturity. There will then remain only \$2,500,000 notes outstanding out of the original issue of \$5,000,000, of which \$500,000 will not be due until January, 1920. The anticipation of debt payment, as well as the resumption of dividends on the common stock, reflects the strong financial condition of the company.

All records for output of steel and rolled products at the Ohio works of the Carnegie Steel Company at Youngstown, Ohio, were broken in March, but no figures have been given out. One of the three new 75-ton open-hearth furnaces has been started, another will be ready in about 30 days, and the third some time in May.

Reports that the bolt works of the Republic Iron & Steel Company, now located at Muncie, Ind., would be removed to Youngstown, Ohio, are officially denied.

In accordance with an agreement entered into by the railroads operating westward from Pittsburgh, on and after July 10, next, the refund of 20c. per 100 lb. on tin plate shipped to Pacific coast points, and fabricated into containers for food products to be exported to foreign countries, will not be paid, the necessity for it having disappeared. The order, as originally issued, specified May 10 as the effective date, but the time was extended 60 days at the instance of the tin-plate manufacturers.

Recently the City Council of McKeesport, Pa., vacated parts of thirteen streets for the National Tube Company, whose National works are located there, and this ground will some time be used by the company in making extensions. As yet no definite plans have been made as to the nature of these extensions.

Puddlers employed by the Youngstown Sheet & Tube Company, Youngstown, Ohio, and A. M. Byers Company, Inc., at Girard, Ohio, are being paid \$6.75 per ton for boiling, this being the same rate paid in March and April in mills that sign the Amalgamated scale.

Nearly 200 employees in the mechanical and electrical departments of the plants of the H. C. Frick Coke Company in the Connellsville coke region met in Uniontown, Pa., recently, to enjoy a smoker and instructive talks by executives of the company. The meeting concluded with a theater party, the employees being guests of the company. A similar function was held at Masetown, Pa., March 31.

Reports that the Ohio Iron & Steel Company, operating Mary furnace at Lowellville, Ohio, would erect a second stack are untrue. This company recently contemplated remodeling Mary furnace by adding a skip hoist and other new equipment, but this has been postponed because of uncertain deliveries of material and the high prices quoted on the proposed work.

The Youngstown Sheet & Tube Company, Youngstown, Ohio, announces that it will pay all employees who are members of the National Guard regular wages when away from work on guard duty or attending annual training encampments.

The bi-monthly meeting of the mechanical section of the Engineers' Society of Western Pennsylvania was held in its rooms in the Oliver Building, Pittsburgh, on Tuesday evening, April 4. George A. Orrok, New York City, read a paper on "The Purchase of Large Machinery."

The Atlas Welding & Supply Company has been incorporated with a capital of \$10,000 by Frederick J. Ketting. 707 Greenfield Avenue, Pittsburgh; Joseph

and Charles B. Gehring, 523 Lowell Street, Pittsburgh, and Frank C. Rugh, 6555 Shetland Avenue, Pittsburgh. The main office and plant will be located at 2930 Penn Avenue, Pittsburgh.

The Hunter Construction Company, Youngstown, Ohio, has a contract to erect a steel building, 80 x 150 ft., for the Trussed Concrete Steel Company in that city.

The Thomas Carlin's Sons Company, Pittsburgh, Pa., has received among recent orders for pans and shears the following: One 9-ft. self discharging pan, one 9-ft. dry pan and one 20 x 12 crusher for the American Steel & Wire Company, at Donora, Pa.; two shears for the Bryden Horse Shoe Company; two 8-ft. wet pans and one 9-ft. dry pan for the Indiana Steel Company; two cropping shears for the International High Speed Steel Company; two cropping shears for the Midvale Steel Company; four 6-ft. wet grinding pans for the H. Koppers Company and one 8-ft. wet pan for Otis Steel Company.

The Federal Radiator Company, New Castle, Pa., has purchased the plant of the Novelty Iron Company, Canton, Ohio, and will move all the patterns and equipment to its own plant. The Novelty company recently reduced its capital stock from \$250,000 to \$10,000. The Federal company will manufacture the line of boilers formerly made by the Novelty company, and will maintain a sales organization in Canton.

Last week the toolmakers at the plant of the Westinghouse Electric & Mfg. Company, East Pittsburgh, went on a strike, demanding an advance of 20 per cent in wages and double time for Sunday work. The company made a counter-offer of a flat advance of 10 per cent and double time for Sundays, which the men accepted, and they returned to work.

The Wheeling Steel & Iron Company, Wheeling, W. Va., maker of steel pipe, skelp, tin plate and other products, has opened offices in 1720-1721 Oliver Building, Pittsburgh, with J. D. Holloway as manager of sales for the Pittsburgh district.

The Whitaker-Glessner Company, Wheeling, W. Va., has decided not to build the contemplated open-hearth steel plant. The reasons assigned are the very high prices ruling for plates and other materials that would be used and also because of the very unsatisfactory deliveries that could be made by the mills, which would much delay the completion of the plant.

The three open-hearth furnaces being erected by the Youngstown Sheet & Tube Company, Youngstown, Ohio, are of 100 tons capacity per heat, instead of 85 tons, as recently stated. They are expected to be finished about July 1.

Ferromanganese Sales at Chicago

The Miami Products Company, Chicago, which expects to blow in its furnace on ferroalloys about April 10, has already sold about 4000 tons of spiegeleisen running up to 50 per cent in manganese. A considerable portion of this is for last half delivery and all that has been offered has been purchased with avidity, the latest sales bringing \$5 per unit. In the Chicago district users of ferromanganese have not encountered particular difficulty in buying for future delivery, but actual shipments of the alloy are reported as being received very tardily. As the local furnace is selling only against such ore as it has in hand there is reason to expect deliveries to conform to the production schedule outlined. The search for manganese ore at whatever distance it may be found presents some of the most interesting phases of this undertaking, itself a creature of the present unique conditions. As much as \$11 a ton has been paid for some all-rail shipments of ore and no lot of ore seems too small or remote to be undesirable.

The Baldwin Locomotive Works received orders for locomotives last week amounting to \$1,850,000, which, it was announced, will keep its present force of 15,000 men at Philadelphia and Eddystone on full time for many weeks. Additional orders will require more men.

PERSONAL

James A. Campbell, president Youngstown Sheet & Tube Company, Youngstown, Ohio, has returned from an extended visit to Hot Springs, Ark. L. J. Campbell, assistant to the president, has departed for Palm Beach, Fla., and other Southern resorts on a vacation.

W. P. Snyder, president Shenango Furnace Company, Pittsburgh, has returned from an extended visit to Palm Beach, Fla.

Thomas W. Murray, for eight years associate sales manager of the Trussed Concrete Steel Company, Youngstown, Ohio, who resigned recently to become general sales manager of the United Fuel Company, Detroit, Mich., was given a farewell dinner at the Hotel Ohio, Youngstown. C. H. Gagen, district manager of sales of the company at Chicago, was toastmaster. Mr. Murray was presented with a monogrammed silver table service, and addresses were made by Julius Kahn, president, and T. H. Kane, general manager of the company. John Bowditch, Jr., has been appointed associate sales manager to succeed Mr. Murray.

Percy D. Siverd, formerly traffic manager of the Garland Corporation, West Pittsburgh, has resigned to accept a similar position with the Pittsburgh Screw & Bolt Company, North Side, Pittsburgh, effective April 1.

James C. Jones, manager of the Cleveland Steel Company, Cleveland, Ohio, and several associates, have acquired control of that company by the purchase of the interests of the Rockefeller Foundation and J. L. Severance. Those associated with Mr. Jones in the control are C. E. Terrell, F. W. Throssell and Charles F. Siegrist of Cleveland and J. V. Cowling of Chicago. The latter is Western sales manager of the company. Mr. Jones, who retains his position as manager, has been elected president, succeeding L. M. Bowers; Frank Rockefeller, who has retained his interest, has succeeded J. L. Severance as vice-president, and Mr. Terrell remains as treasurer and will also be assistant manager. Mr. Throssell has been elected secretary. The company's products are light plates and sheets.

Arthur Falkenau, vice-president Hooper-Falkenau Engineering Company, industrial engineer and architect, Woolworth Building, New York, has become acting consulting engineer of the Canadian Car & Foundry Agency, which is carrying on the production of munitions for Russia in 80 or more plants in the United States and Canada. Mr. Falkenau has had extended experience in munitions manufacture, having made shrapnel for the Government during the Spanish war, and built special machines to his own and Government designs for several United States arsenals. The Hooper-Falkenau Engineering Company has received a number of commissions during the present war from manufacturers desiring advice in munitions production.

Edward F. Entwistle, who has been maintenance engineer for the Maryland Steel Company, Sparrows Point, Md., has resigned to become mechanical engineer of the Pennsylvania Steel Company, Steelton, Pa. His place will be taken by L. F. Coffin, formerly of the Pittsburgh Railways Company.

The Taylor-Wharton Iron & Steel Company, High Bridge, N. J., has elected the following directors: Henry J. Cochran, New York City; Robert Hobson, Hamilton, Canada; Dr. Henry M. Howe, Bedford Hills, N. Y.; James Imbrie and R. Burnham Moffat, New York City; Frank C. Roberts and William Selfridge, Philadelphia; Dr. V. G. Simkhovitch, New York City; Knox Taylor, High Bridge, N. J.; John F. Wallace, New York City. Officers elected are as follows: Knox Taylor, president; Dr. Henry M. Howe, V. Angerer and P. Chrystie, vice-presidents; W. A. Ingram, secretary and treasurer.

At the deferred annual meeting of the American Tool Works Company, Cincinnati, March 30, the following officers were elected: J. B. Doan, president, succeeding the late Franklin Alter; Robert S. Alter, vice-president and foreign manager; Henry Luers,

secretary and treasurer. Directors are as follows: J. B. Doan, Robert S. Alter, L. E. Voorheis, Clifford Wright and Walter Hofer.

George D. Kershaw, superintendent of the main works of the J. I. Case Threshing Machine Company, Racine, Wis., resigned to take the position of works manager of the Rumely Corporation, LaPorte, Ind., effective April 1.

Dr. Carl Hering, consulting engineer and inventor of the Hering electric furnace, has removed his office to 210 South Thirteenth Street, Philadelphia, affording better laboratory facilities.

R. J. Wysor has been appointed superintendent of the blast-furnace department of the Bethlehem Steel Company, South Bethlehem, Pa. He was previously the company's chief chemist.

Owing to a disagreement over certain business policies, C. H. Todd, president Petroleum Iron Works Company, and E. F. Woodsmith, president Pennsylvania Tank Car Company, and also of the Pennsylvania Tank Line Company, the latter two being subsidiaries of the Petroleum Iron Works Company, Sharon, Pa., have resigned. J. P. Sweeney, treasurer of the Petroleum Iron Works Company and its two subsidiaries named above, and John Slater, of Washington, Pa., a member of the board of directors of all three companies, have also resigned. Osborne Mitchell, of Youngstown, Ohio, formerly attorney for the allied companies, was chosen to succeed E. F. Woodsmith as president of the Pennsylvania Tank Car Company and the Pennsylvania Tank Line Company, and George P. Bard, Youngstown, general sales manager, was appointed president of the Petroleum Iron Works Company to succeed Mr. Todd. Successors to Mr. Sweeney and Mr. Slater will be chosen in a short time.

Howard M. Newlin, who resigned as traffic manager of the Pennsylvania Steel Company to become special representative of the Maxwell Motor Company, Detroit, in charge of freight matters, has resigned as president of the Traffic Club of Philadelphia. The members of that organization tendered him a dinner at which he was presented with a gold watch.

Christian Kiechler, president and founder of the Kiechler Mfg. Company, Cincinnati, Ohio, one of the oldest and largest sheet metal plants in the Central West, observed his eightieth birthday April 3 by giving a reception to his employees and friends. A dinner was served in the main shop, which was decorated for the occasion. In his speech of welcome Mr. Kiechler referred impressively to the support he had had from his employees in every department, and also called attention to the fact that the company had been in business in Cincinnati exactly 55 years. He was followed by Max Ulmschneider, one of the company's oldest employees, who presented Mr. Kiechler with a loving cup in behalf of his fellow workmen. Mayor George Puchta and other prominent speakers made brief addresses. About 300 were present.

A. F. Blackwood sends a correction of a personal which appeared in THE IRON AGE of March 30. He states that he resigned as vice-president and manager of the Michigan Steel Castings Company, Detroit, having accepted the office of vice-president and general manager of the Monarch Steel Castings Company of the same city. A. L. Vaneschen did not succeed him as manager of the Michigan Steel Castings Company, but was appointed superintendent.

A. E. Ashcraft and C. B. Rathbun, Beloit, Wis., who have grown to positions of responsibility in the local works of the Fairbanks-Morse Mfg. Company, have been advanced to positions in the Fairbanks scale works at St. Johnsbury, Vt. Mr. Ashcraft will be works manager and Mr. Rathbun chief of the accounting department.

Leigh Beekman Morris, who has been New York district sales manager for the Cambria Steel Company for about four years, was on April 1 made manager of sales in the New York territory for the Cambria Steel Company, for the Midvale Steel Company and for the Worth Brothers Company. It is expected that the offices of the three companies will be consolidated in New York

City, possibly in the City Investing Building, 165 Broadway, where the Cambria offices are now located. Mr. Morris has been identified with the Cambria Steel Company for about 23 years, and in the selling end of the business throughout that time. He has served under Presidents Stackhouse, Price and Donner of the Cambria Steel Company.

F. D. Hoerle has been made assistant general manager of sales of the Donner Steel Company, with headquarters in the Morris Building, Philadelphia.

J. C. Drumm, formerly in charge of instruments in the efficiency department of the Carnegie Steel Company at Duquesne, Pa., has been appointed supervisor of installation of the efficiency instrument department of the Scientific Materials Company, Pittsburgh.

Dr. Walter F. Rittman, who has resigned his connection with the Pittsburgh experiment station of the Bureau of Mines, has been succeeded by E. W. Dean, a chemist, who has been connected with the work of the bureau in Pittsburgh for some time.

I. W. Robertson, chemist, formerly at the Pittsburgh experiment station of the Bureau of Mines, has resigned to take a position with the Akron Rubber Company, Akron, Ohio.

Dr. J. S. Unger, manager of the central research bureau of the Carnegie Steel Company, has moved his headquarters from Duquesne, Pa., to 1054 Frick Building, Pittsburgh.

W. G. O'Malley, general master mechanic at the works of the Pittsburgh Crucible Steel Company, Midland, Pa., tendered a dinner to the mill superintendents at the Pittsburgh Athletic Club, Pittsburgh, on the evening of April 1.

Jacob D. Waddell, formerly general manager of sales of the Brier Hill Steel Company, Youngstown, Ohio, but who resigned three months ago, is at the head of a new company that will build a six-mill sheet plant at Niles, Ohio.

Fred Kent, general manager of the Lodge & Shipley Machine Tool Company, Cincinnati, is to address a meeting of members of the American Society of Mechanical Engineers at Buffalo, April 12, on "Bringing a Shop Up to Date."

An address on French warfare and field fortifications is to be given at St. Louis, April 19, by Major Willing before a meeting of members of the American Society of Mechanical Engineers. Edward Flad, consulting engineer, De Merrill Building, St. Louis, is chairman of the local committee.

W. H. Lewis, formerly superintendent of the Aliquippa works of the Jones & Laughlin Steel Company, but who resigned several years ago, is now connected with the Heppenstall Forge & Knife Company, Pittsburgh, as vice-president and also a director, effective from April 1.

The Canadian Nickel Situation

The Canadian Government has issued an order-in-council prohibiting the export of nickel from Canada save to British possessions, but the operation of it is misunderstood. Provision has been made to allow the International Nickel Company to get all the nickel it requires from its mines in Canada. While nominally export is prohibited, the act does not apply where special licenses are issued. The supply for the International Nickel Company's plant in the United States will not be cut off. The Nickel Company has informed the Canadian Government of its intention to begin the erection of its Canadian refinery immediately.

The demand for nickel for commercial purposes is larger than it has ever been. While great quantities are being used by companies filling war orders the feature of the market is the enormous demand for ordinary uses. Thomas G. Gibson, Deputy Minister of Mines for the Province of Ontario, in a recent article reported that in 1910 the quantity of nickel turned out was 18,636 tons; in 1914, it was 22,750 tons, and in 1915 it was 32,000 tons.

OBITUARY

ARTHUR PUTNAM SCOTT, who has been connected with the Snyder Electric Furnace Company for the past year, died of pneumonia at Montreal, Feb. 17, aged 39 years. He was in that city supervising the installation of a new electric furnace plant. In his work at McGill University he took high honors, including the Logan gold medal in his arts course and the British Association medal in chemistry and metallurgy, and last year won the degree of master of science. Following his graduation in 1898 he was for a time on the staff of the university as a demonstrator in chemistry. In 1899 he became assistant chemist of the Dominion Iron & Steel Company, Sydney, Nova Scotia, and was made chief chemist and assistant metallurgist in 1904. In 1908 he entered the service of the General Electric Company as representative metallurgist at the Brackenridge, Pa., plant of the Allegheny Steel Company. In 1911 he was recalled to Sydney as metallurgist and superintendent of the steel department of the Dominion Iron & Steel Company. In February, 1915, he severed this connection and took up consulting work with headquarters in Montreal. He was appointed head of the metallurgical department of the Snyder Electric Furnace Company in May, 1915. He leaves his widow.

JAMES DANIELS, resident manager for the United States Cast Iron Pipe & Foundry Company, at St. Louis, Mo., died March 30, aged 69 years, after an illness of several months. He was born in England, and removed with his parents to St. Louis in 1849. In 1860 he entered the iron business with Chouteau, Harrison & Vallé, and in 1865 became secretary and treasurer of the Shickle, Harrison & Howard Iron Company, as well as its treasurer. In 1901 the latter company was absorbed by the United States Company and he had been resident manager since that time. He leaves his widow, one son and three daughters.

VICTOR A. KING, West Haven, Conn., for seven years previous to 1882 superintendent of the Winchester Repeating Arms Company, New Haven, Conn., died March 26, aged 90 years. He was a native of Pennsylvania and went to New Haven at the age of 17, entering the employ of the Whitney Arms Company and working on the first Colt's revolvers ever made.

OSGOOD PLUMMER, for many years prominent in the loom and machine-tool business in Worcester, Mass., and an inventor of note, died at his home in that city, April 2, aged 81 years, of heart disease. His last active business connection was as the head of Boynton & Plummer, well known at one time as manufacturers of drilling machines.

EVERETT HOSMER BARNEY, founder and head of the firm of Barney & Berry, skate manufacturers, Springfield, Mass., died March 30, at his winter home at Sarasota, Fla. He had been a large benefactor of his home city, and made several notable contributions of land for park purposes.

The Cyclops Steel Company

The Cyclops Steel Works, Titusville, Pa., which was recently sold by its owner, Charles Burgess, to Carl F. Boker, 115 Broadway, New York, has been transferred to the Cyclops Steel Company, of which Mr. Boker is president. F. C. Kirkpatrick and Walter Bowld, who for some time have been plant managers, remain in that capacity, and Hermann Boker will also have offices at the plant. The board of directors will be somewhat reorganized. The company will continue the manufacture of the same brands of high-speed steel and carbon tool steel it has long made. Its capacity will be more than doubled as soon as possible. Carl F. Boker has sold out his entire interest in H. Boker & Co., and is also no longer agent for the Jonas & Colver, Ltd., Sheffield, Eng., whom he represented in the United States and Canada for over 30 years.

Machinery Markets and News of the Works

VARIED DEMAND GROWING

Remarkable Number of Plant Extensions

Deliveries of Some Machine Tools Are a Little Easier—Automobile Makers and Steel Plants Are Important Buyers

Despite high prices and the difficult subject of deliveries, buying on the part of manufacturers has assumed a steady swing which not only gives promise of continuing but of widening as it becomes easier to get the equipment needed. Seldom, if ever, has there been such a movement to extend production facilities as now exists. Everywhere the number of plant extensions in metal working lines is remarkable.

In New York deliveries have been eased a trifle by offerings of machines which would-be exporters have been unable to send abroad. Cleveland finds that deliveries on contracts, especially of lathes and screw machines, have eased off slightly because of increased production, but that milling machines, planers and shapers are still difficult to obtain. The demand for turret lathes continues heavy, most of the buyers wanting single machines.

Throughout the Middle West the automobile trade is making large requisitions on the machine tool builders for equipment required in new factories and extensions. Automobile parts manufacturers also are active. Among those having requirements are the following: Standard Motor Truck Company, Detroit; Michigan Electric Welding Company, Detroit; Champion Ignition Company, Flint, Mich.; Spartan Radiator Company, Jackson, Mich.; Briscoe Motor Corporation, Jackson, Mich., and Jordan Motor Car Company, Cleveland.

Makers of machine tools also are extending their plants, among them being the Wilmarth & Morman Company, Grand Rapids, Mich.; Monarch Machine Company, Sidney, Ohio; Gardner Machine Company, Beloit, Wis., and others. The Sykes Metal Lath & Roofing Company, Warren, Ohio, has purchased the lath department of the Garry Iron & Steel Company, Niles, Ohio, and also will double the capacity of its own plant at Warren.

Important items in the East state that the new buildings of the Baltimore Dry Dock & Shipbuilding Company, Baltimore, Md., will be started in a few weeks, and will cost about \$500,000. The Baldwin Locomotive Works has let the contract for a large machine shop at Eddystone, Pa., in which superheaters will be manufactured.

The Buffalo Foundry & Machine Company, Buffalo, N. Y., is building an addition to its plant. The W. Robertson Machine & Foundry Company of the same city has purchased the plant of the Buffalo Pen Company, and also will erect an addition to be utilized as a machine shop.

The domestic demand for machine tools in Cincinnati is offsetting the slackening of foreign demand. The steel mills are buying more equipment than ever

before in the history of the trade. Cincinnati tool builders are paying as high as \$3.75 per pound for high speed tool steel. Castings are higher in price also.

The announcement of new shops and extensions is a commonplace occurrence in the Milwaukee district. The P. B. Yates Company, Beloit, Wis., is placing orders for equipment to be used in the manufacture of woodworking machinery. It has awarded the contract for a two-story machine shop.

The D. L. James Mfg. Company, Chicago, is about to erect a plant to contain gear-cutting machinery. The Moline Plow Company, Moline, Ill., has plans for the erection of a factory, 115 x 244 ft. The Link-Belt Company, Indianapolis, Ind., will erect an addition to its plant, 3 stories, 104 x 422 ft., to cost \$160,000.

Trade is picking up rapidly in the Pacific Northwest, and orders for machine tools are being placed more freely. Second-hand tools have been closely cleaned up in that territory.

New York

NEW YORK, April 5, 1916.

Quite a number of machine tools which English speculators and small dealers have been unable to export are finding their way to the domestic market. This is a sequence of the action of Great Britain in December last of prohibiting all imports of tools except under licenses which are only granted under rigid restrictions. It is required that importing firms must have been in business at least two years before the war broke out, and they must do a business exceeding £10,000 annually. There were other restrictions relating to profits.

Where these machines, originally intended for export, are offered for domestic sale high prices are asked, and the disappointed speculator is not dispensing with his profit. Established dealers have been the principal purchasers of the machines and, in turn, have placed them with their customers.

Domestic inquiry continues very good from a multiplicity of directions, and sales continue to be restricted by long delivery, but a satisfactory number of orders are being placed nevertheless. It is easy to obtain lathes, especially from the newer makers. Buyers oftentimes take second-hand machines where they cannot obtain new ones with sufficiently prompt delivery.

Makers of standard machine tools still have their hands full in making deliveries on war orders, although there is little new business of this kind. Russian interests have bought a few tools in the past few days.

The railroads are placing more orders than they were a few weeks ago, but their buying is still under normal. There is an exceedingly active demand for forging machines and some of the makers are unable to make delivery for several months.

The Auburn Ignition Mfg. Company, maker of spark plugs and valve lifters, Auburn, N. Y., has increased its capital stock from \$25,000 to \$60,000 in order to secure more efficient manufacturing facilities and working capital. Its output has steadily increased since the installation of the new management in 1913; and with this year, finds it necessary to expand. S. M. Kitchin is general manager; C. A. Franke, production manager, and H. G. Kitchin, sales manager.

The Eclipse Machine Company, Elmira, N. Y., manufacturer of brakes and motor-cycle clutches, started the construction April 3 of an addition to its plant, 52 x 127 ft., to be added to its case-hardening department. John C. Ferguson is general manager.

The Buffalo Foundry & Machine Company, Buffalo, is building an addition to its plant at Fillmore Avenue, East Ferry Street, and the New York Central Railroad Belt line.

The Turner Construction Company, 11 Broadway, New York, has been awarded the contract for the construction of a three-story storage battery service building for the Exide Garage, 527 West Twenty-third Street, New York. Louis E. Jallade is architect. It will be 100 x 180 ft., three-stories, of reinforced concrete.

The Fluswelder Corporation, Albany, N. Y., has been incorporated to manufacture machinery, patented devices, welding equipment, etc., by C. A. MacMillan, W. K. Kitchen and I. F. Wilson, 30 Church Street, New York City. The capital stock of the company is \$40,000.

Plans are being prepared for a one-story brick machine shop, 56 x 241 ft., to be erected at Brook Avenue and Creek Street for the Nichols Copper Company, Laurel Creek, L. I., N. Y., at a cost of about \$60,000.

Friedman, Robertson & Keeler, 90 West Street, New York, are preparing plans for a one-story brick and concrete artificial ice plant, 86 x 100 ft., to be built at Oliver Street and Shell Road, Elmhurst, Long Island, N. Y., for the Crystal Ice Mfg. Company, 45 West Thirty-fourth Street, New York, at a cost of about \$25,000.

John Laimbeer, Jr., 103 Park Avenue, New York, has the general contract for additions and alterations to the nine-story factory, 100 x 125 ft., at 435 Greenwich Street, for the F. E. Dietz Company, 16 Laight Street, from plans by Lansing C. Holden, 103 Park Avenue. The cost will be about \$30,000.

A wire mill, 82 x 302 ft., two stories, is to be built by the Crucible Steel Company of America, at Syracuse, N. Y. Bids are being taken on plans prepared by M. J. French, architect.

The U. S. Hoffman Company, Syracuse, N. Y., is having plans prepared for the enlargement of its plant on Temple Street at an estimated cost of approximately \$100,000.

The Eaton-Sanford Company, Syracuse, N. Y., has filed incorporation papers showing a capitalization of \$25,000. It will manufacture vacuum cleaners, cleaner utilities, thermostats, etc. W. J. and E. M. Eaton and C. H. Sanford, 107 Union Avenue, Syracuse, are the incorporators.

The W. Robertson Machine & Foundry Company, 32 Greenwood Place, Buffalo, has purchased the plant of the Buffalo Pen Company, Rano Street, Buffalo, and will erect an addition containing 4500 sq. ft., which it will use as a machine shop.

The Safety First Auto Parts Company, Buffalo, has been incorporated with a capital stock of \$25,000 by P. U. Daniel, G. H. Hutchings and F. S. Jackson, Buffalo, to manufacture special auto parts.

By the explosion of a drying machine in the plant of the Tonawanda Board & Paper Company, Tonawanda, N. Y., April 1, machinery was damaged to the extent of \$10,000.

The Rich Ice Cream Company, Buffalo, capitalized at \$100,000, has been incorporated to take over the business of the unincorporated company of the same name. It will erect and equip a new factory for the manufacture of ice cream products, ices, etc. P. J. and E. M. Rich and A. F. Chapin, 470 Spring Street, are the incorporators.

The Rauher-Fien Mfg. Company, Rochester, N. Y., has been incorporated, with a capital stock of \$25,000, by C. S. Rauher, E. L. Fien and G. J. Dash, to manufacture automobile accessories and parts.

The Link Piano Company, Binghamton, N. Y., has been incorporated by E. A. and K. M. Link and G. R. Thayer to manufacture automatic player pianos, organs, etc. The capital stock is \$75,000.

The Champion Hardware Company, Geneva, N. Y., has had plans prepared and will erect an addition to its manufacturing plant this spring.

The Niagara Concrete Mixer Company, Buffalo, has been incorporated by Conrad E., Louis E. and W. L. Wettlaufer, 105 Oak Street, to manufacture concrete mixers, stone crushers, boilers, etc. The capital stock is \$50,000.

The Auto Signal & Equipment Company, Buffalo, has filed articles of incorporation with a capital stock of \$100,000 to manufacture signals and parts for automobiles. C. Kuhn, L. K. Lynn and V. G. Hart, Buffalo, are the incorporators.

Baltimore

BALTIMORE, MD., April 3, 1916.

Dietrich Brothers, Davis and Bath streets, Baltimore, have been awarded the contract for the structural steel work on the new building of the Baltimore Oil Engine Company, Eastern Avenue, Canton, Md. It will be 100 x 200 ft. Engines of the Wygodsky type will be manufactured.

Announcement has been made that work on the new buildings for the Baltimore Drydocks & Shipbuilding Company, Baltimore, will begin within the next few weeks. The improvements, it is stated, will cost about \$500,000.

The New Era Elevator & Machine Company, 111-113 Grant Street, Baltimore, has purchased two lots at Hollingsworth and Grant streets, it is understood for manufacturing purposes.

Fire destroyed the pattern shop at the boiler plant of

McIntyre & Henderson, Key Highway and Warren Avenue, on March 29.

The Hopewell Brick Company, Petersburg, Va., has been incorporated with \$25,000 capital stock. H. K. Browning is manager.

Philadelphia

PHILADELPHIA, PA., April 3, 1916.

The Valley Iron Works, Williamsport, Pa., maker of steam engines, shafting, boiler-feed appliances, etc., is building an addition to its foundry, 40 x 100 ft., to handle increasing business. It is to be completed within 30 days. The equipment has been purchased.

The Marietta Casting Company, manufacturer of hollow ware, Marietta, Pa., is changing its plant over from steam drive to motor drive. George E. Stibgen is secretary and general manager.

The Baldwin Locomotive Works has let contract to the McClintic-Marshall Company, Oliver Building, Pittsburgh, for the construction of a three-bay machine shop and a shop to be used in manufacturing superheaters to be added to its Eddystone plant.

The Graham Roller Bearing Company, Coudersport, Pa., is operating at a capacity of 300 bearings per day, with factory space to produce 2000 bearings a day, when machinery is secured to equip it. The company will manufacture both a straight roller and a thrust bearing for its radial bearings. D. F. Graham is president; F. A. Raymond, vice-president, and A. L. Carter, secretary and treasurer. These officers and R. F. Hibbard and W. H. Wright of Buffalo constitute the board of directors.

It is reported that the Keystone Munitions Company, which has been incorporated by William P. Litts, Charles H. Singer and W. R. Teeter of Scranton, Pa., has plans under way for the erection of a large rifle and cartridge plant, which may be built in or near Scranton.

Contract has been awarded by the John Illingsworth Steel Company, Tacony and Lewis streets, Philadelphia, for the erection of a one-story building, 60 x 150 ft., to the F. T. Mercer Company, 1706 DeLancey Street, Philadelphia. T. E. Schermerhorn, 430 Walnut Street, is the architect.

The Lower Merion school district, William J. Byrnes, secretary, Ardmore, Pa., is receiving estimates for the construction of a one-story stone powerhouse, 24 x 61 ft., to be erected at Bala, Pa. Scheetz & Savery, Girard Building, Philadelphia, are the architects.

It is reported that the New Jersey Coal Mfg. Company, 527 Columbia Avenue, Camden, N. J., manufacturer of briquetted coal, is subletting bids for the erection of a two-story brick factory, 40 x 50 ft., to be erected at 1126 Price Street, Camden.

J. & J. Dobson, Inc., carpet manufacturer, Philadelphia, Pa., has awarded contract to William H. Ambrose, Leverington & Umbria streets, Philadelphia, for the construction of a boiler room to cost about \$3,300.

The Eynon-Evans Mfg. Company, brass manufacturer, Fifteenth and Clearfield streets, Philadelphia, has awarded contract to Harry Gill, Jr., 2515 Germantown Avenue, for the construction of a manufacturing building to cost about \$10,000.

The board of freeholders, Camden County Courthouse, Camden, N. J., has awarded contract to the Baker Engineering Company, Heed Building, Philadelphia, for the construction of a one-story powerhouse, 21 x 44 ft., which will include pumps and two boilers.

Abner H. Mershon, Land Title Building, Philadelphia, has awarded contract to the Fidelity Construction Company, Heed Building, Philadelphia, for the erection of a three-story brick and steel machine shop, 45 x 111 ft., to be erected at 4947 Fairmount Avenue.

The Electric Refrigerator Machinery Company, Philadelphia, has been incorporated with a capital stock of \$25,000 by Henry Bassett, 1032 Arch Street, Philadelphia, treasurer; George C. Hexamer, W. E. Hexamer, John E. Fite, George W. Krout and Henry Evans, all of Philadelphia, to manufacture refrigerating machinery, ice boxes, electrical appliances and apparatus.

The Keystone Surgical Instrument Company, Philadelphia, has been incorporated with a capital stock of \$6,000 by E. F. Cecil, 1718 North Sixteenth Street, Philadelphia, treasurer; Haines D. Albright and Smith Cecil, both of Philadelphia, to manufacture surgical instruments and hospital supplies.

The Berkshire Iron Works, which operates a furnace at Sheridan, Pa., has filed notice of a reduction of capital from \$1,100,000 to \$250,000.

The Perfection Shoe Machinery Company, Stroudsburg,

Pa., has been incorporated with a capital stock of \$10,000 by W. W. L'Hommedieu, Joseph Shiffer and Chester H. Rhoads, Stroudsburg, Pa., to manufacture shoe-making and power transmission machinery. Directors have been elected as follows: The three incorporators: Cornelius E. Loose, Cora E. Loose and J. A. Dabb, 33 Grand Street, New York; J. Charles Zimmerman, 115 Broadway, New York.

Whitney, Felker & Murdock, Inc., Philadelphia, Pa., has been incorporated with a capital stock of \$20,000, by Charles H. Whitney, Bryn Mawr, Pa.; George F. Felker, 30 Church Street, New York; Howard C. Murdock, 184 North Fifty-third Street, Philadelphia, and Frederick W. MacDonald, 16 West Seventy-sixth Street, New York, to manufacture pipe valves, fittings, etc.

The Puritan Mfg. Company, Ellenton, Pa., has been incorporated with a capital stock of \$6,000 by J. Fred, Frances and H. L. Clark, Canton, Curtis W. and Mae Potter, Ellenton, to manufacture novelties.

New England

BOSTON, MASS., April 3, 1916.

New England manufacturers are still badly crippled by the continuance of the embargoes on much of the east-bound freight, with the consequent shortage of raw materials; but prospects are brighter now than for many weeks. The embargo on spelter and copper was raised March 29 to New Haven territory by the committee of the Eastern Freight Accumulation Conference. The lifting of the embargo on domestic west-bound freight has resulted in the clearing of many private sidings which were choked with out-bound loaded cars. Real spring weather now prevails and the trucking conditions in the cities are practically normal.

About 400 machinists at the plant of the Hendey Machine Company, Torrington, Conn., went on strike April 4, demanding a 20 per cent increase in wages, a 50-hr. week with 54 hr. pay, time and one-half for overtime and double time for Sundays and holidays, reinstatement of men recently discharged and recognition of their grievance committee. A strike at the Hendey plant last fall was settled by the granting of a 9-hr. work day.

The Rumford Falls Power Company, Rumford Falls, Me., has had plans drawn for a power station, 60 x 150 ft., three stories.

The William Schollhorn Company, Wooster Street, New Haven, Conn., is to build a four-story addition, 40 x 40 ft.

The Smith & Winchester Company, South Windham, Conn., has plans for a foundry addition, 60 x 127 ft., two stories.

The United Wire & Supply Company, Cranston, R. I., is asking tax exemption on a proposed factory to be erected on land adjoining the Standard Machinery Company at a cost of \$150,000.

The Fafnir Bearing Company, New Britain, Conn., has awarded a contract for the erection of a building, 50 x 100 ft., one story.

The Industrial Company, Boston, Mass., mechanical, electrical and civil engineer, has been incorporated with capital stock of \$50,000 by John W. Farley, president; G. Percival Quimby, treasurer, and S. C. Woodworth.

The New York, New Haven & Hartford Railroad has announced that no permanent buildings will be erected at this time to replace those destroyed by fire, March 26, at the terminal at New Haven, Conn. The company hopes to re-adjust its terminal facilities at New Haven as soon as its finances will permit. The loss has been fixed at \$224,000.

The Connecticut Aircraft Company, New Haven, Conn., has leased the factory at Market and Haven streets, formerly occupied by the Sunshine Bakery. It will manufacture dirigibles, having recently completed the first one ever built for the Navy Department.

The Turner & Seymour Mfg. Company, Torrington, Conn., has announced a 10-per cent increase in wages, affecting all employees.

The Scovill Mfg. Company, Waterbury, Conn., has announced a 10-per cent bonus on wages earned from Jan. 29 to Feb. 5, payable April 5.

The Meisel Press Company, Boston, Mass., has had plans drawn for a four-story addition and general alterations to its plant on Dorchester Avenue.

The New England Westinghouse Company, Springfield, Mass., has awarded a contract for a dry kiln, 124 x 196 ft., one story, at its East Springfield plant.

A. H. Wells & Co., Waterbury, Conn., have purchased a tract of land off Watertown Avenue as a site for a new plant.

The Try-Me Mfg. Company, Springfield, Mass., has been incorporated with capital stock of \$150,000, to manufacture pressure regulators, valves, etc. The incorporators are Olen E. Doty, president and treasurer; S. S. Shepard and James A. Mahoney.

The Federal Brass Foundry Company, Boston, Mass., has been incorporated with capital stock of \$10,000. The directors are F. M. Callahan, president; Ralph C. Barnstead, treasurer, and C. A. Digney.

The addition to the powerhouse of the Bridgeport Brass Company, Bridgeport, Conn., will be 42 x 101 ft., one story.

The Ball & Roller Bearing Company, Danbury, Conn., has purchased a tract of land, comprising seven acres, on White Street, Danbury. It is reported that it is planned to erect a one-story factory which will provide three times the present amount of floor space. L. R. Helm is president.

The Springfield Brass Company, Springfield, Vt., has been incorporated with capital stock of \$80,000 by Paul E. Luther, Hugh McPhee and Fred B. Gill.

The New London Ship & Engine Company, New London, Conn., is building a two-story pattern shop, 60 x 155 ft.

The Holyoke Valve & Hydrant Company, Holyoke, Mass., has awarded a contract for a factory, 100 x 234 ft., four stories. It will occupy two floors and rent the other two.

The General Electric Company has bought 232,715 sq. ft. of land at Atwells and Harris avenues, Providence, R. I., on which, it is reported, it plans to erect a factory for making electric lamp bases.

Chicago

CHICAGO, ILL., April 3, 1916.

The number of plant extensions in metal-working lines is remarkable. Not only has the volume of orders available to the operators of machine shops been such as to tempt, if not compel, radical enlargements of capacity, but earnings arising from the excellent prices obtainable have solved the problems of financing further plant investments. Among recent instances is the two and three story addition, 78 x 120 ft., which the D. O. James Mfg. Company, Chicago, gear cutter, is about to erect at a total cost for buildings and new equipment of \$40,000. It is expected that nearly half of this will be expended for additional gear-cutting machinery with motor drives. The Gage Structural Steel Company will build a one and two story structural steel shop, 66 x 200 ft., on South Hoyne Avenue and the Morava Construction Company is building an addition to its shop. Other manufacturers are rearranging their plants to permit of the installation of added equipment and the market has shown, particularly in the last few weeks, in the number of orders for one, two and three machines for shops within a radius of 100 miles, the effect of this expansion. The improvement in the machine tool situation with respect to deliveries of standard lines of tools is being taken advantage of more generally, though the whole matter of deliveries continues a serious handicap. Sales of second-hand machinery, last week, were again very heavy. The Killark Electric Mfg. Company, Twenty-second, Washington and Lucas avenues, St. Louis, Louis Desloge, secretary, is in the market for screw-cutting and plating machinery.

The Marvel Machine Company, Chicago, has been organized with a capital of \$50,000 by Luke R. Phillips, William Y. Serrin, 940 Lakeside Place, and John S. Perry.

The Alemite Metals Company, Chicago, has increased its capital from \$25,000 to \$50,000.

The Allen Tractor Company, Chicago, has increased its capital stock from \$25,000 to \$35,000.

The Marvel Steel Products Company, Chicago, has been organized with a capital of \$25,000 by John C. Leiger, Daniel F. Ramsey and Theodore F. Ehler, 712 West Thirty-third Street.

The Dean Turbo Motor Company, Chicago, has been incorporated with a capital stock of \$2,500 by Robert C. Dean, Earl D. Hochstadter and Burton P. Gale, 6111 Kimbark Avenue.

Robert M. Fair, Chicago, is to build a three-story automobile service station at Indiana Avenue and Twenty-fifth Street to cost \$85,000.

The Modern Power Appliance Company, Rockford, Ill., has been organized with a capital of \$5,000 by S. G. Smith, H. H. Rogers and William D. Knight.

The Buchanan Mfg. Company, Eldorado, Ill., will build a one-story brick addition to its plant.

The Roesch Stove Company, Belleville, Ill., has been incorporated with a capital of \$15,000 by William Busiek, Joseph P. and Arthur A. Roesch, and will erect a plant in that city.

The Moline Tool Company, Moline, Ill., has plans for the erection of a one-story factory, 150 x 244 ft., to cost \$30,000.

The Galesburg Railway, Light & Power Company, Galesburg, Ill., Ralph Carley, superintendent, will make improvements to its plant involving an expenditure of \$225,000.

The McCadden Machine Works, St. Cloud, Minn., has been

incorporated with a capital stock of \$50,000 to manufacture piston rings, automobile and machine parts.

The Faribault Packing & Provision Company, Faribault, Minn., has plans for six buildings to be erected this season.

The Western Chemical Mfg. Company, Denver, Col., has increased its capital stock from \$600,000 to \$1,000,000. An addition to the plant has just been completed, at a cost of \$180,000.

The Universal Hoist & Mfg. Company, Cedar Falls, Iowa, expects to build a new factory, as soon as it can procure a suitable location.

The Chicago, Milwaukee & St. Paul Railroad has purchased property adjacent to its shops in Dubuque, Iowa, and it is understood the intention is to double the capacity of these shops.

The property of the Smedley Steam Pump Company, Dubuque, Iowa, including buildings and real estate, cranes, lathes, dynamos, machines, patterns, tools, raw materials and stock, will be sold at auction April 15. Philip Schwinn is receiver.

The Hildred-Nelson Company, 47 East Third Street, St. Paul, Minn., recently incorporated, will act as a dealer in power plant equipment, machinery and supplies, not as a manufacturer, as has been stated.

Cleveland

CLEVELAND, OHIO, April 3, 1916.

Deliveries on some types of machine tools, particularly lathes and screw machines, have eased off slightly owing to increased production brought out by the recent unprecedented demand. There is no improvement, however, in deliveries on milling machines, planers and shapers. The demand continues very active, but sales are mostly for single tools. Inquiries for lots of several machines are fairly plentiful, but some of this business is placed rather slowly, owing to high prices and unsatisfactory deliveries. The demand for turret lathes continues quite heavy, orders being mostly for single machines. An inquiry for 50 or 60 screw machines by an Indianapolis manufacturer, reported to have taken a large order for timing fuses, came out the past week. This is the first round lot of machinery for munition work that has developed in the local market for some time. The heaviest machine-tool demand appears to be from companies having large orders for forgings and automobile parts. Some business is being booked for 1917 shipment at prices to be fixed at the time of delivery.

A new automobile plant will be established in Cleveland by the Jordan Motor Car Company, which has acquired a site on East 152nd Street, near St. Clair Avenue. Contract has been placed for a one-story brick and steel building, 100 x 300 ft., and the plans provide for three additional units of the same size to be erected later. Edward S. Jordan, formerly secretary and sales manager of the Thomas B. Jeffery Company, is president.

The Sykes Metal Lath & Roofing Company, Warren, Ohio, has purchased the metal lath department of the Garry Iron & Steel Company, Niles, Ohio, which will greatly increase its manufacturing facilities. It is also planning to double the capacity of its Warren plant for the manufacture of metal lath and other sheet metal building products.

The Canton Electric Company, Canton, Ohio, will erect a new machine shop, garage and storage building to be two stories, 60 x 99 ft.

Lewis Brothers, Lima, Ohio, have completed plans for a one-story factory, 110 x 150 ft., for the manufacture of veneer doors and other interior finish. Work will be started at once.

The Napoleon Mfg. Company, Napoleon, Ohio, recently organized with a capital stock of \$50,000 to establish a plant for the manufacture of automobiles, has elected as president A. O. George, at present chief engineer of the Fostoria Light Car Company. F. M. McGrew is general manager.

The T & T Mfg. Company, Kenton, Ohio, successor to the Kenton Gas Engine Company, has closed its plant and disposed of the greater part of its equipment to the Detroit Steel Package Company, which will use it to enlarge its plant.

The Sandusky Road Machine Company, Sandusky, Ohio, is being formed with a capital stock of \$25,000 by Isaac A. Kennedy, J. J. Davich and others to manufacture road machinery.

The American Steel Foundries has commenced the erection of an addition, 65 x 150 ft., to its foundry at Alliance, Ohio. It is understood that other extensions are contemplated.

The Walter Concretile Mfg. Company plans to establish a plant in Fremont, Ohio, for the manufacture of roofing materials, and will occupy quarters in the plant of the Fremont Waterproofing Company.

Milwaukee

MILWAUKEE, WIS., April 3, 1916.

The establishment of new shops and the extensions of existing metal-working plants are everyday occurrences. Machine-tool builders are not slowing up, although the overwhelming demand of several months ago has given place to a more normal tone. Tool builders, however, are booked so far ahead that fluctuations in the demand, however sharp, cannot yet affect production to an appreciable extent. No large lot orders have been placed in some time, but the volume of business is well maintained by the steady and insistent demand for single tools or small lots, principally in standard types, which are more easily produced. The used machinery market is almost bare, and tools are picked up as rapidly as presented. Structural shops are engaged in the busiest period known in several years. There are only a few conspicuously large jobs under way, but the aggregate of the small-tonnage contracts is exceptionally large.

The general contract for the erection of a new machine shop for the P. B. Yates Machine Company, formerly Berlin Machine Works, Beloit, Wis., has been awarded to John Schneiberg Company, Beloit. It will be of brick and steel, two stories, 265 x 283 ft. The contractor will purchase a number of electric traveling cranes; three electric elevators and other material. The company is placing orders for tools and other equipment for the manufacture of wood-working machinery.

The Vacuum Machinery Company, Marinette, Wis., has been organized with a capital stock of \$25,000 by Ralph Skidmore, L. M. Skinner and A. C. Hawkins.

Sealed bids will be taken by M. E. McCaffrey, secretary, board of regents, University of Wisconsin, Madison, until April 24, for the erection of a new pumping station for the university group. Plans have been prepared jointly by J. M. Smith, engineer, and Arthur Peabody, architect, State university. The work is in charge of J. D. G. Mack, State chief engineer, Madison.

A small machine shop has been established at Campbellsport, Wis., by the Sielaff Motor Repair Company.

The Kiel Woodenware Company, Kiel, Wis., has increased its capital stock from \$100,000 to \$200,000, and intends to largely increase its facilities. Definite plans are not ready for announcement. H. C. Mesch is manager.

The Gardner Machine Company, Beloit, Wis., manufacturing grinding machines, has awarded the general contract to the Newton Engineering Company, 185 Mason Street, Milwaukee, for extensive improvements projected several months ago. The machine shop will be enlarged by an addition 100 ft. square, and a new powerhouse, 40 x 60 ft., will be erected. The Gardner works have been working night and day for nearly a year, and still has not been able to cope with demand. Most of the business comes from domestic buyers, although the company has made extensive shipments to Europe in the last two years. L. Waldo Thompson is secretary.

Plans for a public garage and small machine shop for Hugo Ernst, Oconomowoc, Wis., are being prepared by A. C. Eschweiler, architect, 720 Goldsmith Building, Milwaukee. It will be of brick, concrete and steel, two stories and basement, 74 x 99 ft. Bids will be taken about April 17.

The Milwaukee Light, Heat & Traction Company, Milwaukee, will build a new boilerhouse at Racine, Wis., at once. Two new 500-hp. boilers will be required. S. B. Way is general manager.

H. R. Graham, 33 Patton Building, Milwaukee, will build a public garage and repair shop on Hopkins Street, between Twenty-third and Twenty-fourth Streets, to be 44 x 120 ft., to cost about \$10,000.

The DePere Electric Light & Power Company, DePere, Wis., is arranging to remodel its plant to change the current output from direct to alternating. Plans have been prepared by H. A. Smith, consulting engineer, Madison, Wis. The expense will be approximately \$20,000. L. L. Tessler is superintendent.

The W. H. Hobbs Supply Company, Eau Claire, Wis., hardware and plumbing manufacturers, has increased its capital stock from \$60,000 to \$100,000 to accommodate the increase in its business.

Contracts will be awarded this week for the erection of a harness and saddlery hardware factory at Sheboygan, Wis., for the J. C. Nichols Harness Company, Janesville, Wis. The architects are Hilton & Sadler, Janesville.

George Zagel, architect, 629 Walnut Street, Milwaukee, is in charge of plans and construction of a garage and small machine shop on Nineteenth Street, of brick and steel, two stories, 48 x 54 ft. The owner's name is withheld.

The Algoma Motor Car Company, Algoma, Wis., will

award contracts this week for erecting a garage and machine shop, 60 x 100 ft. G. F. Rider is manager.

The Chicago Rubber Clothing Company, Racine, Wis., has awarded contracts for the erection of a brick factory addition, to cost about \$15,000. The work is in charge of Nelson & Conway, Racine.

The Foster Creek Lumber & Mfg. Company, Madison, Wis., has been incorporated by Madison, Milwaukee, Chicago and New York interests to operate in Mississippi. The capital stock is \$1,500,000. A double band sawmill with resaw will be built and equipped as soon as possible. An investment of \$350,000 is planned. The location is in Wilkinson County, Miss., on the main line of the Yazoo & Mississippi Railroad, and the annual capacity will be 30,000,000 ft. of lumber. George L. Stephenson, Milwaukee, is secretary and general manager.

The Universal Foundry Company, Oshkosh, Wis., has been incorporated with a capital stock of \$10,000 by L. J. Monahan, J. D. Termaat and A. C. Ziebell, for many years identified with the gas engine, foundry and machinery business at Oshkosh.

The Wisconsin Valley Electric Company, Wausau, Wis., will spend \$50,000 in improvements in the next two months. V. A. Alderson is secretary.

Cincinnati

CINCINNATI, OHIO, April 3, 1916.

The local labor situation is unchanged, but unconfirmed press reports state the machinists in several shops at Columbus, Ohio, have made a demand for a nine-hour day with no reduction in pay. So far no strikes have been called there.

The domestic call for machine tools continues on the increase, largely offsetting the slackening foreign demand. It is stated that the steel mills are buying more machine shop equipment just now than at any time in the history of the trade. Manufacturing costs continue on the increase, and shop operators who have not laid in a supply of high-speed steel are now compelled to pay as high as \$3.75 a lb. for some brands. The price of castings has also been marked up several times lately, but not to such an alarming degree. Although it was thought that the supply of second-hand machine tools, especially lathes, had been exhausted, dealers report quite a number of single-tool sales made lately.

The boiler business is only fairly satisfactory, but the demand for different sized tanks is good. Small electric motors and generators are in excellent demand.

The Mechanical Supplies Company, Cincinnati, whose incorporation was noted last week, has leased quarters at Third and Hammond streets. Jacob Mueller and E. A. Richter are the principal incorporators.

It is reported that Emil Haberer, Cincinnati, is to head a company that will be organized to build automobile bodies. Tentative arrangements have been made for securing a factory in West End.

The Sayers & Scoville Company, Cincinnati, whose carriage factory was recently almost completely destroyed by fire, will rebuild its plant, greatly increasing its former capacity.

The Icy-Hot Bottle Company, Cincinnati, will enlarge its plant on West Second Street.

The Standard Electric Tool Company, 128 Opera Place, Cincinnati, has leased additional space on the fourth floor of the building it occupies to be used for office and storage purposes. Its present office space will be used for manufacturing purposes.

The Dayton Metal Products Company, Dayton, Ohio, is reported to have commenced shipment on a contract for war munitions for the United States Government.

The Bauer Brothers Company, Springfield, Ohio, has tentative plans under way for a large addition to its plant.

The Myers Auto Top Company, Springfield, Ohio, will soon move into a new building and greatly increase the capacity of its plant.

The Keystone Vehicle Company, Columbus, Ohio, will increase its capital stock to \$40,000. It has leased a building at Fourth and Goodale streets that will be fitted up for the manufacture of automobile bodies.

The Standard Bolt Company, Columbus, Ohio, has been incorporated with \$500,000 capital stock by H. E. Vance, E. H. McCloud and others.

The Kinnear Mfg. Company, Columbus, Ohio, is a new incorporation with \$750,000 capital stock. H. B. Peters is named as one of the principal incorporators.

T. C. Dunlap is president of the Dunlap Machinery Sales

Company, Columbus, Ohio, recently incorporated with \$10,000 to deal in machine tools.

The name of the Midgley Tire & Rubber Company, Lancaster, Ohio, has been changed to the Lancaster Tire & Rubber Company, and the capital stock increased from \$550,000 to \$850,000. Extra equipment will be installed in its plant.

The Monarch Machine Company, Sidney, Ohio, machine tool builder, has had plans prepared for an addition to its plant that will be 100 ft. square, one story, of sawtooth roof construction, to be used principally for storage purposes.

The Griffith & Wedge Company, Zanesville, Ohio, manufacturer of Corliss and gas engines, has reincorporated with a capital stock of \$375,000, \$150,000 preferred and \$225,000 common. F. A. Bishop, Cleveland, has been added to the members of the company. New officers have been elected as follows: C. B. Wedge, president; H. O. Fulkerson, vice-president; F. A. Bishop, secretary, and Edward Gigax, treasurer. Within the next six months it will double the present capacity of the plant and will add several new lines of manufacture, notably the manufacture of structural iron work. The work of enlarging the plant and making other necessary changes will be started at once.

The Champion Tool Works Company, V. H. Kreuzburg, president, Cincinnati, Ohio, is reported to be contemplating building a large plant in Cheviot suburb. No details are yet available.

The Central South

LOUISVILLE, KY., April 3, 1916.

Practically unparalleled activity continues to be reflected in the local machinery trade. Capacity operations are the rule and distributors of machinery are finding it difficult to keep up with orders. The car shortage has been the cause of more or less delay, but is reported as somewhat improved, while materials are reported more easily available. Some of the local factories are using want ads to get workmen. Extensive building and development programs are laid out, mining, lumbering, etc., and Kentucky has a good roads program calling for 6500 miles of roads this year, including numerous bridges.

The Louisville Fire Brick Company will increase the capacity of its plant at Grahn, Ky., raising the production rate from 33,000 to 45,000 standard fire brick daily. K. P. Grahn, Ninth and Kentucky streets, Louisville, is president.

The Commonwealth Invention Syndicate, manufacturing a patented device to prevent flickering in motion pictures, has increased its capitalization from \$30,000 to \$50,000. Extension of the plant at 213 South First Street, Louisville, is not now projected. W. F. Axton, Robert J. Ball and George Chase are stockholders.

R. Mansfeld & Son, Inc., has been organized with \$20,000 capital to carry on the store fixture and wood-working plant of the late R. Mansfeld, 621 East Market Street. R. Mansfeld, Theodore Korb and E. C. Wirth are the incorporators.

Fire destroyed the plant and stock of W. O. Tucker & Co., chair makers, at South Main Street, Marion, Ky.

D. H. Ewing & Sons will erect a three-story fireproof creamery and bottling plant at the corner of Third and Kentucky streets, Louisville, Ky., at a cost of \$80,000.

The Kentucky Utilities Company, Mt. Sterling, Ky., has plans for enlarging its ice plant and installing new machinery which will involve an expenditure of about \$15,000.

Ault & Wiborg, Cincinnati, Ohio, ink and dyestuff manufacturers, have purchased a barium sulphate bearing land near Stamping Ground, Ky., from the Elkhorn Chemical Company, and will erect a chemical and dyestuff plant.

The Frankfort Motor Car Company, Frankfort, Ky., will remodel its garage and machine shop on Main Street at a total estimated cost of \$10,000.

The Atlas Stone Company, Olive Hill, Ky., has added a new 300-hp. boiler to its equipment, and is making further improvements.

Prather Brothers, Georgetown, Ky., are building an addition to their machine shop, 40 x 105 ft.

The Ashland-Greenup Traction Company, Ashland, Ky., has filed articles of incorporation and projects an eleven-mile electric line to connect Ashland, Russell and Greenup, Ky.

Losses estimated at up to \$100,000 were suffered by the Borderland Coal Company, headquarters Cincinnati, in a fire which destroyed the tippie of plant No. 2, and the electric powerhouse. The plant will be rebuilt.

John W. Hoadley & Co., Bloomington, Ind., will rebuild their stone mill at an estimated outlay of \$10,000. The old

mill at Stinesville, was destroyed by fire. The new mill will be located in Bloomington.

The Pacific-Iron Mountain Railway plans improvements to its terminals, yard tracks and roundhouse at Memphis, Tenn., at an estimated cost of \$150,000.

The Sykes Milling Company, W. P. Sykes, president, will establish a 200-bbl. flour and 500-bu. mill at Cleveland, Tenn. The Wolf Company, Chambersburg, Pa., has the plans.

W. P. Biddle, Knoxville, Tenn., is in the market for a 100-hp. return-tubular boiler, complete less steam, and a 50-hp. center-crank automatic engine, both second-hand.

Prices on boilers, etc., are asked by the National Waterproofing Company, 917 Tennessee Trust Building, Memphis, Tenn. Motors, fans, sewing machines, etc., will be installed.

Indianapolis

INDIANAPOLIS, IND., April 3, 1916.

The Merchants Heat & Light Company, Indianapolis, will spend \$280,000 for new boilers, engines, stokers, etc., at its main and substations.

The Link-Belt Company, Indianapolis, will erect an addition to its plant, three stories, 104 x 422 ft., to cost \$160,000.

The Partlow-Jenkins Motor Car Company, Indianapolis, has been incorporated with \$25,000 capital stock to manufacture automobiles. The directors are J. L. Partlow, J. H. Jenkins and D. Partlow.

The Lewis-Forbes Lumber Company, Indianapolis, has been incorporated with \$25,000 capital stock to manufacture lumber. The directors are T. R. Lewis, B. M. Forbes and R. C. Williams.

The Frankfort Mfg. Company, Frankfort, Ind., has been organized with a capital of \$500 to manufacture iron, brass and other metals. The incorporators are Charles J. Watkins, Wendell B. Montgomery, John A. Johnson, John S. Shanklin and Thomas M. Ryan.

The Simmons Mfg. Company, Huntington, Ind., will erect a factory for the manufacture of various paper articles.

The Vulcanite Roofing Company, Anderson, Ind., has plans for the erection of a new building.

G. I. Sellers & Son Company, Elwood, Ind., will erect two more buildings, in order to accommodate a large amount of additional machinery of which they are in need.

The Huntington Steel Foundry Company, Huntington, Ind., has been incorporated with \$225,000 capital stock to make iron and steel castings. The directors are Edwin B. Ayres, H. E. Rosebrough and J. W. Caswell.

The Aerothrust Engine Company, Laporte, Ind., has been incorporated with \$100,000 capital stock to manufacture engines. The directors are George L. Crook, Robert H. Izor and A. J. Stahl.

The Haskell & Barker Car Company, Michigan City, Ind., has changed its name to the Michigan City Car Company.

A thirty days' option has been obtained on the factory buildings of the M. Rumely Company, at a purchase price of \$100,000, by J. H. Mills, chairman of the factory committee of the Richmond Commercial Club, Richmond, Ind. The United States Refrigerator Company, Peru, Ind., is ready to occupy part of the plant as soon as the buildings have been remodeled.

The Laurel Motor Car Company, Richmond, Ind., has been incorporated with a capital stock of \$60,000 to manufacture automobiles. The directors are Charles E. Hayes, Harry Gates and James H. Oates.

Orders have accumulated at the plant of the Bucyrus Steam Shovel Company, Evansville, Ind., and it will put on a night shift to handle them.

Detroit

DETROIT, MICH., April 3, 1916.

The Standard Motor Truck Company, Detroit, has completed plans for its new building, 130 x 160 ft., three stories, and construction will be begun immediately. It is estimated that the cost of the building and equipment will approximate \$200,000.

The Shuler Axle Mfg. Company, Detroit, has been incorporated with \$10,000 capital stock to manufacture axles, etc. The incorporators are Frank A. Shuler, John A. Kean and Richard A. Dewey.

The Miller Tool & Mfg. Company, Detroit, has been incorporated with \$15,000 capital stock to manufacture tools. The incorporators are A. L. and R. H. Miller and C. L. Campbell.

The Michigan Electric Welding Company, Detroit, manu-

facturer of automobile parts, has acquired the factory of the L. N. Beaker Company adjoining its plant, thus providing about 14,000 sq. ft. of additional floor space.

The Grand Rapids Blow Pipe Company, Detroit, will erect a one-story brick factory, 62 x 144 ft., to cost about \$8,500.

The plant of the Pennsylvania Salt Mfg. Company, Wyandotte, Mich., was damaged about \$200,000 by fire March 26. Immediate steps will be taken to rehabilitate the plant.

The recently organized Pontiac Gray Iron Company, Pontiac, Mich., has acquired the foundry department of the Pontiac Foundry & Machinery Company and will begin operations at once. Harvey C. Wilson is president.

The Brownwall Engine & Pulley Company, Holland, Mich., has increased its capital stock from \$25,000 to \$50,000.

The American Heating Company, Grand Rapids, Mich., will build an addition to its foundry to cost about \$5,000.

The Champion Ignition Company, Flint, Mich., has completed plans for an addition to its factory which will add about 12,500 sq. ft. of floor space.

The Burchard-Roberts-Wales Company, engineer, Cleveland, has prepared plans for a new plant to be erected by the Spartan Radiator Company, Jackson, Mich., for the manufacture of automobile radiators. It will be two stories, of brick and steel, 70 x 336 ft.

The Wolverine Paper Company, Otsego, Mich., will build a one-story addition to its factory, 80 x 112 ft., to cost in the neighborhood of \$25,000.

Gavin Ritchie & Son, Battle Creek, Mich., will erect a one-story fireproof foundry, 40 x 120 ft., adjoining its machine and blacksmith shop, which will cost about \$7,000.

The Gile Tractor & Engine Company, Ludington, Mich., will erect a building, 20 x 60 ft., the second addition to its plant this year.

The Wilmarth & Morman Company, Grand Rapids, Mich., is having plans prepared for an addition to its factory, as an expansion of the machine shop.

The Briscoe Motor Corporation, Jackson, Mich., is receiving bids for the erection of a new plant.

St. Louis

ST. LOUIS, MO., April 3, 1916.

The machine tool business continues to show activity and growth so far as deliveries will permit. Transactions are all spot. No disposition is shown to send out lists of equipment for bids. Industries in need of machines simply go into the market, hunt for what they want and take it as soon as they can find it. The matter of price has little to do with any of the transactions reported. All lines of equipment are impartially active and the industrial demands seem to be increasing. Practically no second-hand tools are to be found.

The Dorse Electric Company, St. Louis, Mo., has been incorporated with a capital stock of \$10,000 by A. S. I. J. and Leigh Dorse to do a general manufacturing business.

The Merry Optical Company, St. Louis, Mo., has been incorporated with a capital stock of \$50,000 by Fred C. and Charles L. Merry and Charles N. Sheldon to manufacture optical goods.

The Keys Piston Ring Company, St. Louis, Mo., has increased its capital from \$15,000 to \$30,000 for the purpose of increasing its equipment.

The American Mfg. Company, St. Louis, Mo., maker of cordage, has begun the erection of an addition to its subsidiary plant, the Standard Mills, Eleventh and Chouteau avenues. It is estimated about \$40,000 of equipment will be required.

The Monsanto Chemical Works, St. Louis, will erect an addition to its chemical plant, representing a total investment of more than \$100,000. John F. Queeny is president.

The Wagner Electric Mfg. Company, 6400 Plymouth Avenue, St. Louis, Mo., has begun the erection of an additional factory, which may require some equipment.

The plant of the National Coöperage Company, Peoria, Ill., was damaged by fire March 30.

The coal-loading machinery of the chutes of the Vandalia Railroad at Effingham, Ill., were burned March 26 with a loss of \$14,000.

The Chillicothe Gun Stock Mfg. Company, Chillicothe, Mo., will install in its plant now under construction a mill with a capacity of 70,000 ft. of gunstock material each two nine-hour shifts, one 38-ft. bandsaw, 16 small bandsaws, four cut-off saws, one 150-hp. Corliss engine, two boilers, etc.

The Abbott Lumber Company, Fayetteville, Ark., has been incorporated with a capital stock of \$40,000 by Harvey McCracken, F. M. Platter and William Abbott and will equip a mill.

The Earle Cooperage Company, Earle, Ark., A. Sweaney manager, will equip a plant at West Memphis, Ark., at a cost of \$60,000, to handle timber from a 10,000 acre tract.

The Interstate Compress Company's plant at Hobart, Ark., which has been burned with a loss of \$50,000, will be replaced.

The Minnesota Electric Light & Power Company, Alworth Building, Duluth, Minn., will receive bids shortly on a plant at Cushing, Okla., to develop 350 kw. D. G. Lewis is local manager.

The Scandinavian Glass Mfg. Company, Avant, Okla., has been incorporated with a capital stock of \$20,000 by A. W. Anderson, R. N. Neal, R. T. Frickholm and O. A. Nystrand.

The Fagan-Peel Company, Waynesboro, Miss., is in the market for waterpower equipment, turbine wheel preferred.

John K. Kaye will equip an electric light and power plant at Booneville, Miss., utilizing in part a plant which he has acquired. The total cost is to be about \$25,000.

The Free Stump Extracting Company, Laurel, Miss., W. P. Ratliff, Charles Green, E. E. Ferrill and B. F. Schneider stockholders, will equip a plant for the manufacture of stump-pulling machinery.

Newman McKinstry and others of Hattiesburg, Miss., will equip a sawmill at Monarch, Miss., of 25,000 ft. a day of hardwood capacity.

J. H. Sandifer, Magnolia, Miss., will rebuild his saw, grist and rice mills, recently destroyed by fire.

The Southern Car Seal Company, Columbus, Miss., has been incorporated with a capital stock of \$25,000 by L. F. Richardson, president, and others, and will equip a plant with a capacity of 50,000 seals daily.

Eastman, Gardiner & Co., Laurel, Miss., will equip a plant for the manufacture of box shooks, with a capacity of about 15,000 ft. daily.

The Natchez Dressed Beef Company's plant at Natchez, Miss., has been damaged about \$50,000 by fire.

The Calcasieu Ice & Mfg. Company, Lake Charles, La., J. A. Bel president, will install machinery with a daily capacity of 50 tons of ice.

Birmingham

BIRMINGHAM, ALA., April 3, 1916.

The only complaint in the machinery trade at this time is the old one of deliveries. This is especially the case in machine tools. The demand for hydroelectric apparatus is very active. The sawmill trade continues good and a steady demand for boilers, pumps and engines is coming from the coal and ore mines.

It is understood that the site on the Warrior River for the steam auxiliary power plant of the Alabama Power Company has been chosen and will be announced by President J. A. Mitchell upon his visit to Birmingham. The company sold a bond issue of \$4,000,000 with which to build this plant, and another hydroelectric unit on the Coosa River.

The Florala Sawmill Company, Florala, Ala., will rebuild its dry kiln and lumber sheds recently burned with a loss of \$25,000.

The North Alabama Warehouse & Compress Company, Attalla, Ala., has increased its capital stock from \$20,000 to \$50,000.

The Central of Georgia Railway, Savannah, will install an electric lighting and pumping plant at Tybee Island.

The Williams Mfg. Company, Macon, Ga., has been incorporated by F. W. Williams and others with a capital stock of \$100,000 to manufacture lumber.

The Port Wentworth Lumber Company, Savannah, Ga., has been organized with a capital stock of \$1,000,000, to unite the interests of the Great Eastern Lumber Company, the Southern Seaboard Lumber Corporation and properties of the Hilton Dodge Lumber Company. I. H. Fetty, Kansas City, H. G. Levick, Boston, Mass., and R. B. Moffatt, New York, are among those interested.

The Lyon Lumber Company, Tarpon Springs, Fla., has been incorporated, with a capital stock of \$500,000, by C. H. Lutz, J. B. Lyon and others. It will build a sawmill at Gulf Pine with a daily capacity of 60,000 to 70,000 ft., a planing mill with a capacity of 40,000 ft., dry kilns, etc., to cost \$100,000.

Pass Christian, Miss., will spend \$45,000 for a waterworks system. Xavier & Kramer, Magnolia, Miss., are the engineers.

The Interborough Power Company, Spartanburg, S. C., has been incorporated, with a capital stock of \$100,000, by A. M. Law, R. E. Boggs, W. G. Willard and others to erect a hydroelectric plant on the Tyger River to develop 3000 hp.

The Gulf Cup & Still Company, Pensacola, Fla., is in the market for a wire-straightening machine, either new or second-hand. W. S. Garfield is in charge.

Texas

AUSTIN, TEX., April 1, 1916.

Trade is somewhat depressed on account of the backwardness of farm operations, due to the prolonged drought. The installation of irrigation pumping plants is receiving an unusual amount of attention.

The Kenedy Light & Power Company has been incorporated with a capital stock of \$10,000 to build an electric light and power plant at Kenedy. E. B. Fehrenkamp is a stockholder.

The Gulf Coast Oil Corporation, Houston, which has been incorporated with a capital stock of \$90,000, will operate in the oil fields of South Texas. R. C. Duff is one of the incorporators.

A. D. Kennedy, Greenville, and associates, plan to build a cottonseed oil mill at Dallas to cost about \$750,000.

The Lutcher & Moore Lumber Company has placed an order for planing machinery for the sawmill it is building at Orange, with the P. B. Yates Machine Company, Beloit, Wis. The mill and equipment will cost about \$750,000.

The Polar Ice & Fuel Company, McKinney, will build an ice factory to cost about \$40,000. Thomas E. Craig is president.

The Sugarland Mfg. Company is preparing to build a sulphuric acid plant at Sugarland at a cost of about \$300,000.

Taylor Brothers will rebuild their cotton gin at Denton which was recently destroyed by fire. The new plant will cost about \$10,000.

The sawmill of Carter & Kelly, Manning, recently destroyed by fire, will be rebuilt at a cost of about \$100,000.

The Star Clay Products Company, San Antonio, has increased its capital stock from \$100,000 to \$150,000 and will enlarge its brick and tile manufacturing plant.

The San Antonio Belt & Terminal Company has authorized the issue of \$1,750,000 in three-year notes, the proceeds to be used in the construction of terminals at San Antonio for the Missouri, Kansas & Texas Railroad.

Phelps, Dodge & Co., New York City, who recently purchased mines in the Organ district for \$1,500,000, plan to build an electric power plant and make other improvements.

The Pacific Northwest

SEATTLE, WASH., March 28, 1916.

Business shows improvement. Lumber mills are opening up, and many are now running double shifts. Recent statistics indicate that for the first time since the spring of 1913 80 per cent of them in Washington are now operating. Shipbuilders and manufacturers of logging and mill specialties are exceptionally busy. The local manufacture of many other classes of machinery and metal products is growing rapidly. With prospects of stable conditions in the machine-tool market, orders are placed more freely. Second-hand tools are closely cleaned up. Mining districts are experiencing unprecedented activity, and a large volume of miscellaneous machinery business is coming from that direction. The Alaska mines also are buying freely. Marine engines are in strong demand, and some large internal-combustion engines of foreign make have recently been bought.

The car shortage is becoming less acute, and railroads are bending every effort to relieve the congestion.

The Duncan Lumber Company, Portland, Ore., recently closed a contract with the Entente powers for 4,500,000 ft. of Douglas fir, shipment to be made within 90 days. Another rush order from them has been placed with the Wauna mill of Portland for 80,000 ft. of spruce for use in constructing aeroplanes.

The Western Fir Lumber Company, recently organized at Tacoma, Wash., plans to build a new mill in that city.

The J. A. McEachern Company, Seattle, Wash., has acquired a frontage of 1200 ft. on Youngs Bay, Astoria, Ore., and will erect a shipbuilding shop. It will at first build barges for Government use in Alaska.

The Merchants' Central Heating Company, Spokane, Wash., is ordering machinery for a large electric power plant, the investment amounting to about \$1,000,000.

The Price Lumber & Box Company, Spokane, Wash., has been incorporated for \$5,000 by C. Price, D. C. Russell, Alex. M. Winston. It is understood the construction of a box factory is planned.

The Rattan Mfg. Company, Seattle, Wash., has increased

its capital stock to \$15,000 and contemplates the installation of additional machinery to increase its output.

The Western Fir Lumber Company, Tacoma, Wash., will soon begin work on the sawmill to be constructed on the old Tacoma waterfront. It will have capacity of 75,000 ft. in 10 hr., and will cost between \$40,000 and \$50,000. W. A. Whitman is secretary and treasurer.

The Beaver State Auto Company, Gresham, Ore., will build a brick foundry and will add the manufacture of malleable castings to its products. The building is to be completed by June 1.

The Bend White Pine Sash Company, Minneapolis, Minn., has announced its intention of establishing a factory in the vicinity of Salem, Ore.

John Weinberg, owner of the Columbia Iron Works, Astoria, Ore., has sold a half-interest in the company to William Silvo of Astoria. Complete new equipment will be installed, with addition of a welding outfit.

The Atlas Foundry & Machine Company, Tacoma, Wash., is having plans prepared for a new concrete building to be three stories, 32 x 100 ft. The estimated cost is \$10,000. Heath & Gove are the architects.

It is reported that the Pacific Coast Steel Company has announced its intentions of starting work within thirty days on the steel plant and rolling mills to be erected in Portland, Ore. About \$400,000 is to be expended.

The Hofus Steel & Equipment Company, Seattle, Wash., has recently purchased sixteen acres of land at the head of Duwamish Waterway, Seattle, with 1400 ft. of waterfront. It obtained the site for future developments of its plant in that vicinity. George J. Danz is president.

The Inland Empire Paper Company, Spokane, Wash., has awarded contract for the construction of a new sulphite mill, which when completed and equipped will cost between \$225,000 and \$250,000.

Canada

TORONTO, April 1, 1916.

The Canadian Foundries & Forgings Company, Brockville, Ont., will build an addition to its tool department to take care of increased business.

It is reported that the Canada Iron & Foundry Company, Three Rivers, Que., has received a war order and that it is necessary for the company to build an addition to its plant.

The Canadian Explosives plant at Nobel, near Parry Sound, Ont., was damaged recently by a fire which started in one of the shrapnel houses. The plant will be rebuilt.

The Bauman & Letson planing mills at Elmira, Ont., which were destroyed by fire with a loss of \$20,000, will be rebuilt.

The O'Briens Munitions Ltd., Renfrew, Ont., will build a new plant at a cost of \$75,000, to replace one recently destroyed by fire.

The Canada Wire & Iron Goods Company, King William Street, Hamilton, Ont., will erect an addition to its plant to cost \$3,500.

The Conley Frog & Switch Company, Memphis, Tenn., which discontinued the work on the erection of its plant at Port Arthur, Ont., on account of financial conditions created by the war, will complete the plant now, and expects to have it ready for operation by July 1. The company will manufacture frogs, switches, bolts, nuts, and railroad necessities. J. E. Conley is in charge.

C. A. Dunning, general manager of the Saskatchewan Co-operative Elevator Company, Regina, Sask., recently closed a deal for a waterfront site at Port Arthur, Ont., on which it will build a terminal elevator to have a capacity of 2,500,000 bu. Work will be commenced early in the summer and the elevator will be completed in time to handle the 1917 crop.

The Precision Tool & Machine Company, Ltd., Montreal, has been incorporated with a capital stock of \$50,000. Gages, jigs and fixtures will be manufactured at the plant, which is located at 1645 St. James Street. H. E. Streeter is works manager.

The Wallaceburg Brick Company, Box 164, Wallaceburg, Ont., is in the market for a single cylinder, 50-hp. or over, stationary, natural gas engine.

The Seymour Motor Car Company, Vancouver, B. C., has been incorporated and will take over the plant of the Begg Motor Company at 632 Seymour Street, Vancouver. W. E. Richardson is manager.

The Baldwin Mfg. Company of Canada, Ltd., Winnipeg, has been incorporated with a capital stock of \$1,000,000. G. L. Constable, Winnipeg, is president. It will erect a plant at Winnipeg for the manufacture of grain threshers, implements, etc.

The Steel Company of Canada, Hamilton, Ont., will com-

mence soon the erection of an addition to cost \$24,000. Robert Hobson is general manager.

The Forwell Foundry Company's plant at Berlin, Ont., was damaged by fire with a loss of \$5,000.

The roundhouse at Regina, Sask., owned by the Canadian Northern Railway Company, Toronto, was destroyed by fire with a loss of \$15,000.

The Volta Mfg. Company, Welland, Ont., has secured a site of one and a half acres and will erect a brick and steel factory, 50 x 60 ft., two stories. The plant will be so constructed as to allow for further extensions. The company manufactures specialties for electric furnaces, etc. R. Turnbull and John Young are the owners.

The Perfection Tire & Motor Company, with plants at Fort Madison, Iowa, and Wabash, Ind., are carrying on negotiations with the City Council, Niagara Falls, Ont. The company is contemplating the erection of a plant to manufacture automobiles, tires, etc., to cost upward of \$300,000.

W. C. Cowan, 200 Victoria Street, Berlin, Ont., is preparing plans for a factory to be erected for the Canadian Regal Motor Company, Ltd., at Berlin, to cost \$18,000.

The Acme Rubber Company, Brampton, Ont., recently incorporated, will build a factory there to manufacture rubber tires, rubber goods, etc., to cost \$30,000. F. D. Law, 471 Yonge Street, Toronto, is a stockholder.

The Canada Iron Corporation, Three Rivers, Que., has awarded the contract to Loomis, Dakin, Ltd., St. Gabriel Street, Sherbrook, Que., for an addition to its plant.

D. H. Langlois & Co., St. John, Que., will build a furniture factory to replace the one recently destroyed by fire with a loss of \$16,000.

Vanbossor, Ltd., Toronto, has been incorporated with a capital stock of \$40,000 by Francis H. Hurley, 44 King Street, West, Joseph N. Bullen, 21 Grenadier Road, Harold L. Steele, and others to manufacture machinery, tools, etc.

The Hodgson Brothers Chemical Company, Ltd., Lindsay, Ont., has been incorporated with a capital stock of \$200,000 by Thomas Hodgson, James I. Hartr, Orillia, Ont.; John H. Lowry and others of Lindsay, Ont. It will build a chemical plant at Lindsay to cost \$60,000. Thomas Hodgson, Orillia, will be in charge of the construction.

The Hamilton Stock Brick Supply Company, Ltd., Hamilton, Ont., has been incorporated with a capital stock of \$40,000 by Edward New, William H. Cooper, John E. Frid and others.

Machineries Ltd., Montreal, has been incorporated with a capital stock of \$20,000 by J. W. Blair and others to manufacture machinery, tools, implements, etc.

The Govan Motor & Threshing Company, Ltd., Govan, Sask., has been incorporated with a capital stock of \$20,000 to manufacture motors, threshing machines, traction engines, etc.

The Commercial Motor Bodies & Carriages, Ltd., Toronto, has been incorporated with a capital stock of \$40,000 by Harvey B. Setterington, 32 Adelaide Street, East, Elizabeth Knox and others to manufacture motor vehicles, carriages, etc.

The Hillcrest Lumber Company, Ltd., Renfrew, Ont., has been incorporated with a capital stock of \$400,000 by James N. Austin, George B. Ferguson, Daniel W. Stewart and others to operate sawmills, planing mills, blacksmith shops, and to manufacture lumber and wood.

The North American Shipping Company, Ltd., Winnipeg, has been incorporated with a capital stock of \$48,000 by John T. Haig, Alexander Adams, John J. Keelan and others to build ships, drydocks, etc.

The Peerless Weaving & Belting Company, Ltd., Hamilton, Ont., has been incorporated with a capital stock of \$150,000 by Edward DeEtte Matteson, Edward F. Gingras, Jacob Dlicher, all of Buffalo, N. Y., and others, to manufacture leather beltings, etc.

Government Purchases

WASHINGTON, D. C., April 3, 1916.

Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, schedule 9475, for nine forced draft blowers for Brooklyn; schedule 9476 for one motor generator for Boston and two motor generator sets for Brooklyn.

Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, schedule 9483, for one hydraulic banding press, and schedule 9484, for one tool-room lathe for Mare Island; schedule 9487, for one plate edge planing machine and schedule 9491 for one outfit for cutting steel plates and forgings for Brooklyn; schedule 9493, for one combination shearing, punching and angle cutting machine for Norfolk; schedule 9509, for one sand mixing machine for Mare Island, and schedule 9514, for one double frame steam hammer for Brooklyn.

NEW TRADE PUBLICATIONS

Skylight Construction.—Asbestos Protected Metal Company, Pittsburgh, Pa. Bulletin No. 56. Contains an extended description of a special type of skylight construction using asbestos protected metal. The special features of this skylight, which is known as the Waugh glazing construction, include the use of rolled steel section to carry the load with a protective covering to guard against corrosion, an asbestos protected metal gutter on the underside to collect the condensation from the glass and a cap of similar material. Views of a number of buildings in which this form of skylight has been installed are presented and a number of drawings of details are included. A suggested skylight specification is included, together with a shorter one. An illustrated description of the skylight appeared in *THE IRON AGE*, Nov. 18, 1915.

Blast Furnace Construction.—William B. Pollock Company, Youngstown, Ohio. Twenty-ninth supplement to a general book of views of blast furnaces. Contains photographs of the first blast furnace that was built in Australia, that of the Broken Hill Proprietary Company, Ltd., for which this company furnished a complete blast furnace, cinder and metal cars, open-hearth steel ladles, charging boxes, etc. Some idea of the amount of material furnished may be gathered from the statement that a special train of forty-seven freight cars was required to haul the entire equipment.

Friction Clutches.—Conway & Co., Cincinnati, Ohio. Catalog No. 12B. Treats of a line of friction clutches which are made in three types, a compression clutch for general service, an expansion type for use with printing and similar machinery and a machine tool clutch designed for counter-shaft service. The special advantages claimed for all the clutches are the small amount of space required, complete frictional contact, floating leverage action and ease of adjustment. Descriptions of all three clutches are presented, the text in each case being supplemented by engravings of the clutch and its various parts and dimension tables. The various features of the line which are common to all three clutches are listed on the last page.

Open-Hearth Steel Products.—C. Pardee Works, Perth Amboy, N. J. Pamphlet. Contains a list of the company's various open-hearth products which are divided into two general classes, hot rolled and cold finished. The products listed include round, square, hexagonal and flat merchant bars; angles, shafting, and cold finished steel squares, hexagons and flats. Lists of the sizes of each product that can be furnished are given, together with the standard steel classification and list of extras.

Lathes.—Greaves-Klusman Tool Company, Cincinnati, Ohio. Booklet entitled "G-K Betterments." Illustrates a line of quick change engine lathes, which are built with swings of from 16 to 30 in. inclusive. Friction double back gear and geared head single pulley drives are provided for all the machines, and in addition the two smaller sizes have a four-step cone pulley single back gear drive. Under the engravings of the different machines the particular features of each are presented and following this is a description of the various parts that are common to all the lathes, the text being supplemented by numerous engravings. A condensed specification table divided into two classes for the geared head and cone pulley drives and covering all the lathes built is a feature.

Manganese Steel Products.—American Manganese Steel Company, McCormick Building, Chicago, Ill. Four bulletins. The first, No. 52, mentions a liner for tube mills, consisting of a series of plates and lifting bars. The various features of the liner are touched upon and a sectional view of a tube mill with the liner in place is presented. This is followed by a somewhat detailed description, the text being supplemented by views of the various parts. A comparison of the service obtained from this liner and another standard make is presented and a partial list of users is included. The second bulletin, No. 56A, describes a line of wearing parts for several types of standard jaw crushers, such as movable and stationary jaw plates, cheek and toggle or adjusting plates, toggle bearings and chutes. A number of views of the different parts are presented with diagrams showing the information that must be furnished in ordering. The third bulletin, No. 63, presents a number of views of various types of manganese steel chains and sprockets, including a rivetless chain, the links and pins of which can be easily detached or assembled without the use of tools. In connection with the engravings of the different chains, condensed specification tables are given. The last bulletin, No. 65, covers a line of steel castings for steam shovels and dipper dredges. The various parts, all of which are illustrated, are steam shovel

and dredge dipper teeth, dippers, dipper lips and fronts, dipper shaft pinions, racks and latches and latch keepers. Brief descriptions of the various classes of service for which the different parts are particularly adapted are included.

Grab Buckets.—Link-Belt Company, Thirty-ninth Street and Stewart Avenue, Chicago, Ill. Book No. 238. Calls attention to two types of grab buckets, one for excavating and handling coal, crushed stone, gravel, sand and other abrasive materials, while the other is designed for a general run of work on practically all material. Brief descriptions of the two buckets are presented, the text being supplemented by a number of illustrations and dimension tables and diagrams. A number of views of the buckets in actual use are included.

Quarter-Turn Valves.—Homestead Valve Mfg. Company, P. O. Box 1754, Pittsburgh, Pa. Catalog. Size, 6 x 9 in.; pages, 44. Refers to a line of valves for various purposes, which are designed to open and shut by a quarter turn of the valve stem. The valves listed include straightway, three and four way, angle and blow-off types. Illustrations of these are given with brief descriptions and tables of the sizes that can be supplied. Mention is made of a regrinding and renewable blow-off valve, which was illustrated in *THE IRON AGE*, Oct. 21, 1915. Illustrations of the parts of a standard valve and some of the special types that have been made to meet the particular requirements of customers are presented, and a complete telegraph code is included.

Gear and Wheel Puller.—Baird Machinery Company, 123 Water Street, Pittsburgh, Pa. Folder. Refers to a device for removing plain wheels, pulleys or gears from shafts where the space around the gear or pulley is limited. A number of views of the device in use are included.

Metal Cutting Machinery.—Charles E. Wright Company, Kenilworth, N. J. Metal section catalog D. Gives a general description and specifications for a line of metal cutting machinery, such as band saws of various types for different kinds of metal stock, metal slitting machines and power hack saw machines. Mention is made of an automatic metal saw sharpening and tooth hardening machine and brazing and saw setting machines. Partial lists of users of the machines are included in a number of cases.

Chucks.—Skinner Chuck Company, New Britain, Conn. Circular. Devoted to a line of universal geared screw and scroll chucks, which are made in both the three and four jaw types. Illustrations of the various chucks are presented with lists of the sizes that can be supplied in each, and a condensed set of specifications is included.

Manganese Steel Chains.—Jeffrey Mfg. Company, Columbus, Ohio. Bulletin No. 171. Illustrates and describes a line of manganese steel chains, sprockets and attachments for all classes of elevator and conveyor service. The particular field for which these chains are recommended is the handling of gritty and abrasive materials where the substances being handled actually come in contact with the chains and sprockets. The illustrations of the various links are approximately full size and in connection with these information is given as to the number of links per foot and the attachments that can be used with them.

Cement Tile.—Federal Cement Tile Company, 921 Westminster Building, Chicago, Ill. Folder. Describes chiefly by drawings and halftone engravings a line of book, hollow flat slab and hollow pitched cement tile for roofing industrial establishments. The way in which the tiles are installed is shown and there are a number of views of roofs constructed of this material. In connection with the drawings of different kinds of tile, dimensions and weights are given.

Condensing Equipment.—C. H. Wheeler Mfg. Company, Philadelphia, Pa. Catalog. Gives a brief discussion of the economy of high vacuum and the thermodynamics of condensers, followed by descriptions and illustrations of various types of condensing equipment. The lines covered include jet, barometric and surface condensers; vacuum, centrifugal and direct-acting steam pumps; feed water heaters, water cooling towers and spray cooling systems. In connection with these descriptions, halftone engravings of the various pieces of apparatus are presented, supplemented by line engravings showing the construction and possible arrangements. In a number of cases the engravings are views of actual installations.

Rubber Belting.—Peerless Rubber Mfg. Company, 31 Warren Street, New York City. Catalog section No. 113. Relates to the general subject of rubber belting and its application for the transmission of power and the conveying of material. The various brands are briefly described and the trademarks reproduced. Illustrations of the belting in actual use are presented and considerable useful information on the application of belting to transmit power, the capacity of the belt, the size of pulleys to be used and the methods of fastening the ends is given. Mention is also made of the other kinds of mechanical rubber goods made.

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